



# HYBRID TECHNOLOGY IN FOREST MACHINES

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**LOGSET**

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# Content

- Logset company presentation
- Hybrid technology in forest wheeled harvester
- The hybrid experience – Feedback from the field

# LOGSET Oy

Logset is a leading provider for **sustainable forestry equipment solutions.**

The company has launched world's first hybrid harvester in 2016 and its products are known for:

- **Productivity**
- **Low fuel consumption**
- **Durability**

Headquarter and factory are located near Vaasa in Finland.

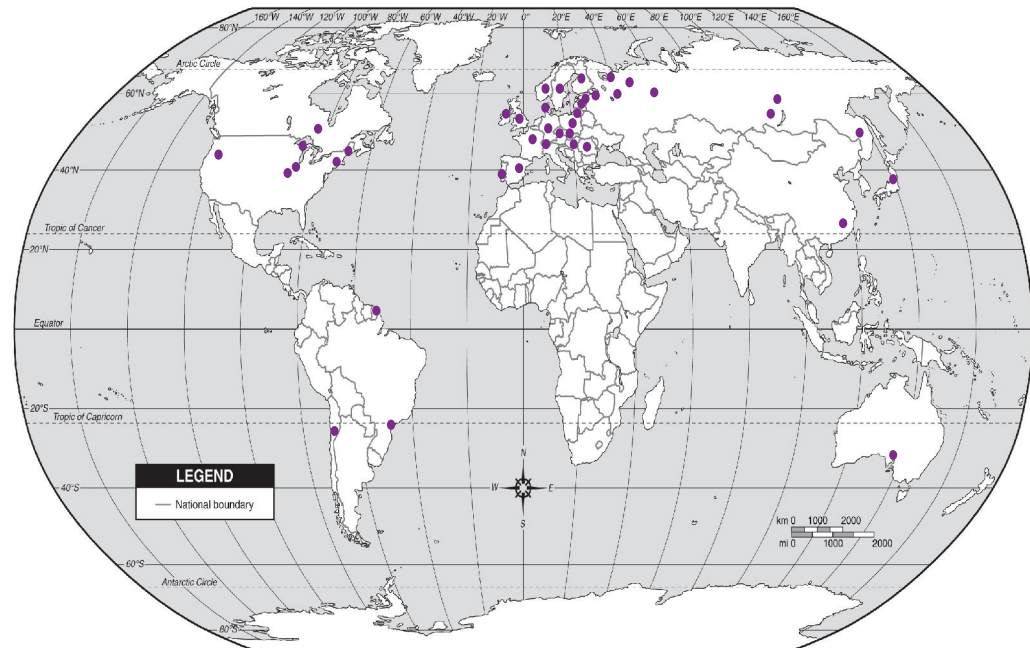


# DISTRIBUTION NETWORK

Distribution network is based on independent dealers, excluding Finnish market, network which covers more than 25 countries.

Latest dealer agreements:

- Fabric CAT USA
- Milton CAT USA
- Tehnokom Russia
- Daltehntrade Russia
- Pesa Brazil
- Minusa Brazil



Dealers are supported by multicultural sales and product support team.



# Company history

**1976**

Norcar established

**2005**

70 % of the company sold to Finnish capital Investors. Logset became part of the Pilomac group.

**1992: Oy LOGSET Ab**

Company established due to change in ownership. Kristian Sten, Gustav Franzén, Seppo Koskinen bought Norcar.

**2012: LOGSET Oy**

Merger between Logset and the Pilomac group. Logset continues as an independent company

**Logset MISSION today:**  
**To provide solutions for sustainable forestry harvesting**



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# LOGSET PRODUCT RANGE



**6 x HARVESTERS**



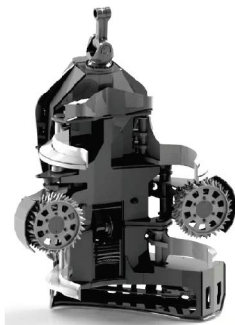
**TOC 2**  
 Operating system



**7 x FORWARDERS**



**TOC-MD 2**  
 Measuring device



**7 x HARVESTING  
 HEADS**



**SIMULATOR**

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6

# ■ Hybrid technology in forest wheeled harvester

# LOGSET 12H GTE HYBRID

Logset has launched the world  
first hybrid wheeled harvester  
in 2016



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8



# Advantages with the hybrid solution

## 1. Outstanding power and torque

- Immediate torque and power response
- Productivity and performance

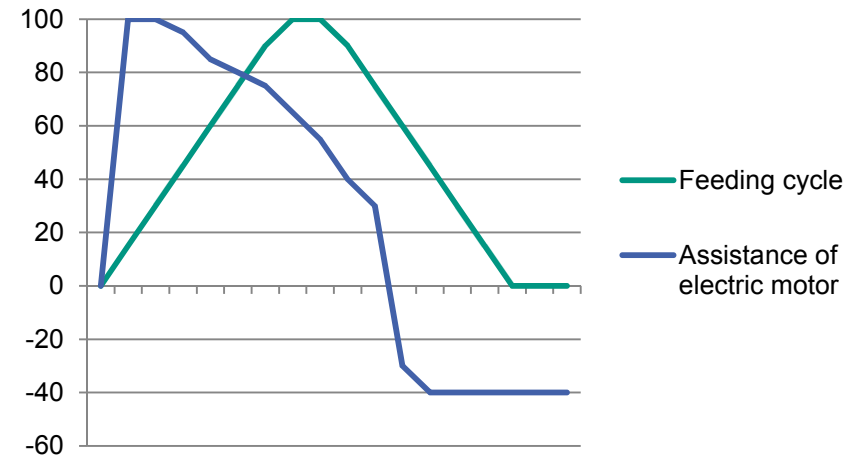
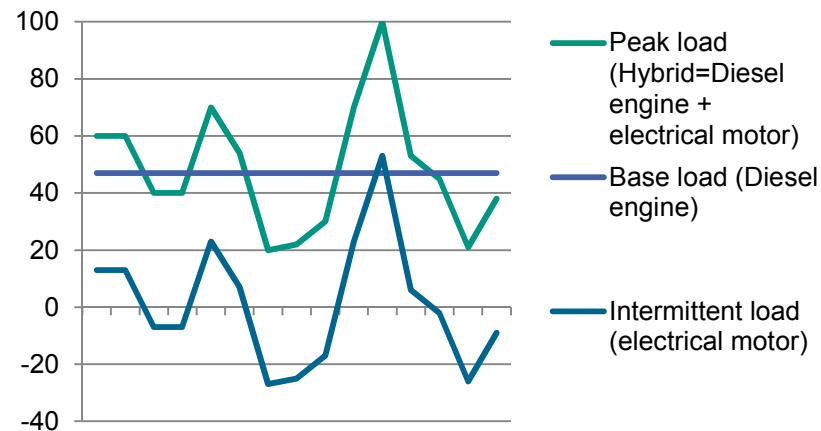
## 2. The best fuel efficiency

- Clear improvements, especially in l/m<sup>3</sup>

## 3. Low emissions

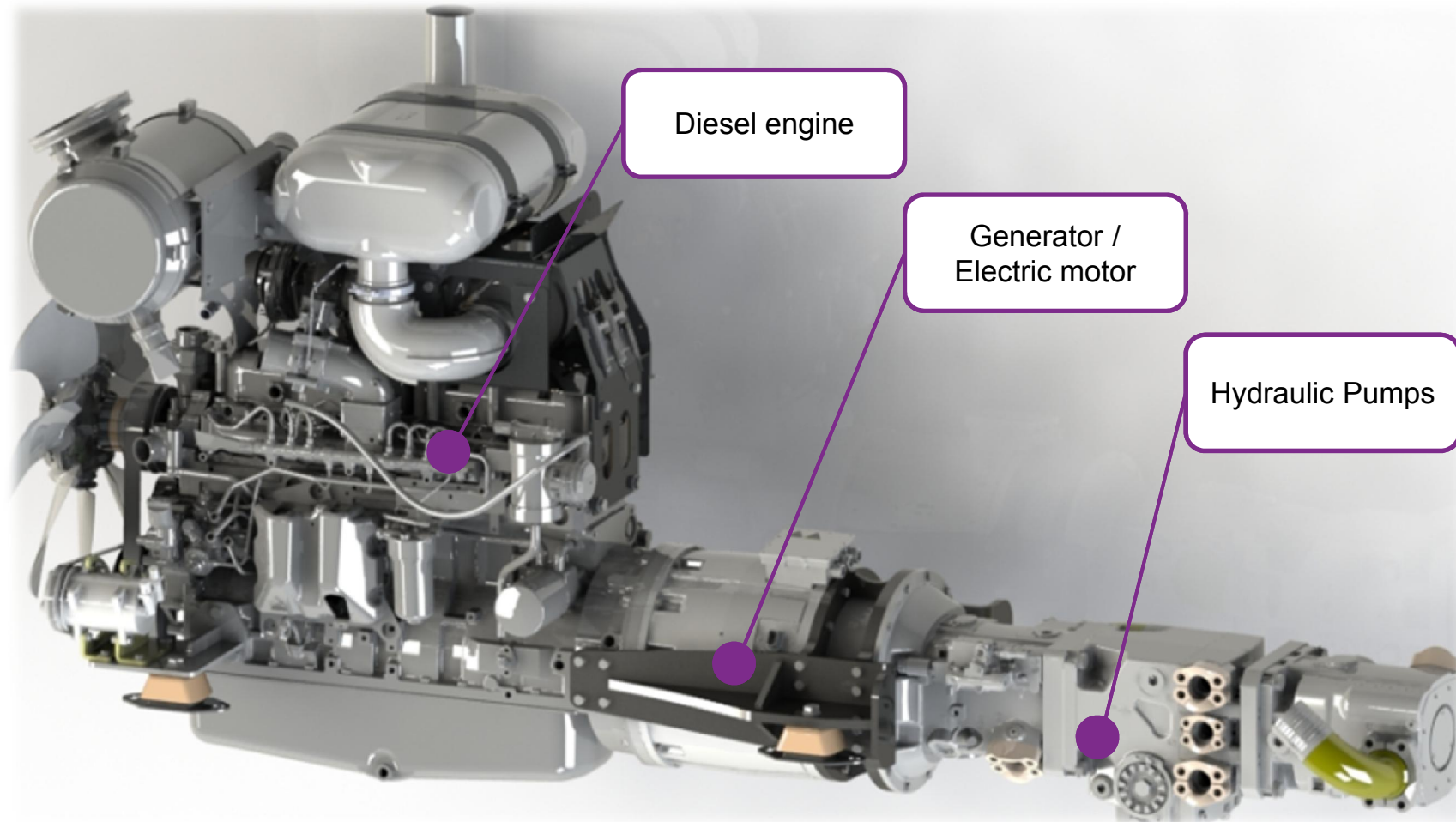
- Environmental benefit with less emissions

# Parallel Hybrid – Basic Idea

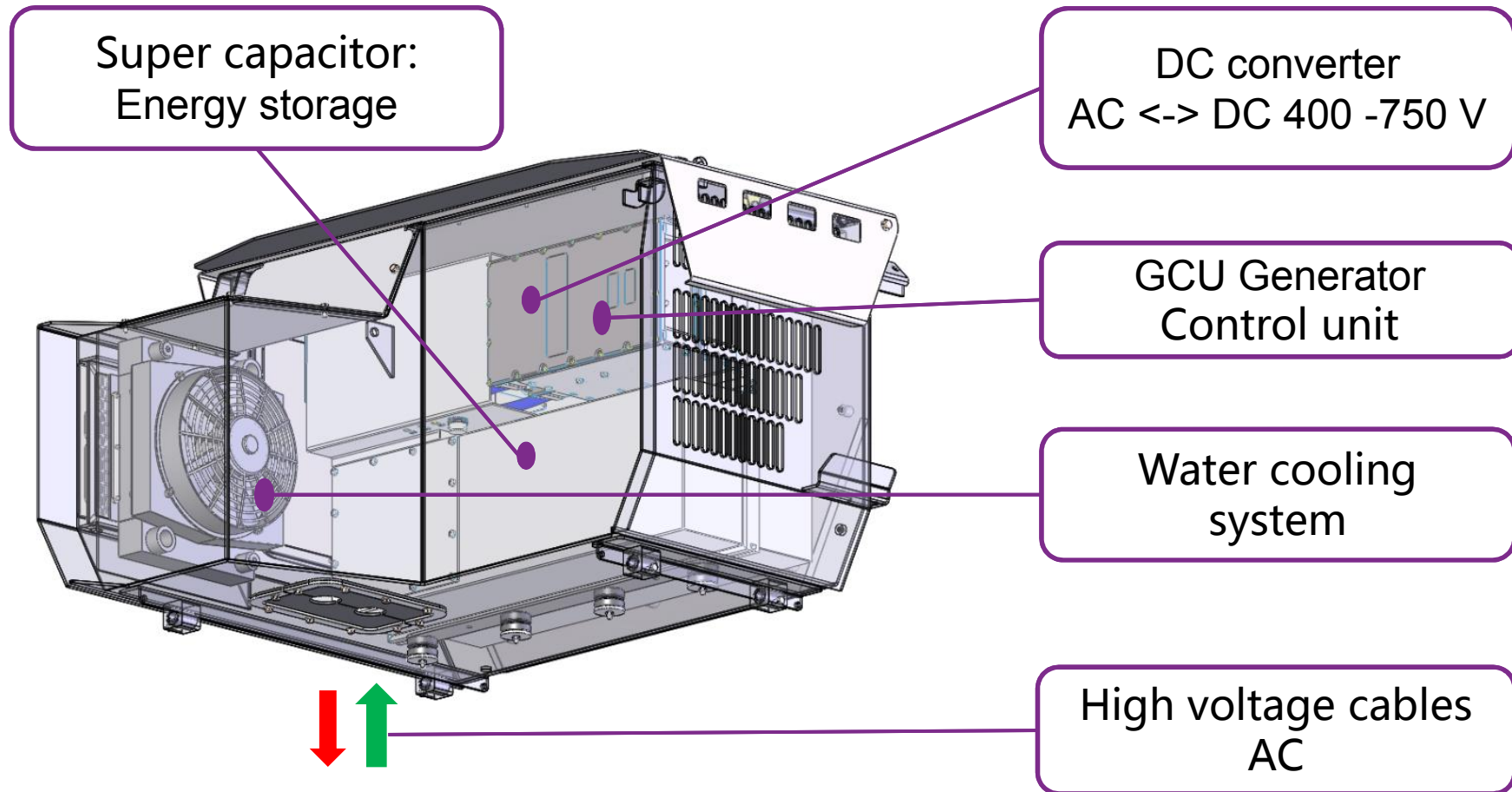


- Peak loads can heavily vary when harvester is operating
- Traditionally the dimension of the diesel engine is based on peak load
- Combined with the hybrid technology, the diesel engine can be sized on the base load
- This allows lower fuel consumption, lower emissions, and it reduces the noise level with no compromise of the machine's performance

# Layout of the hybrid generator

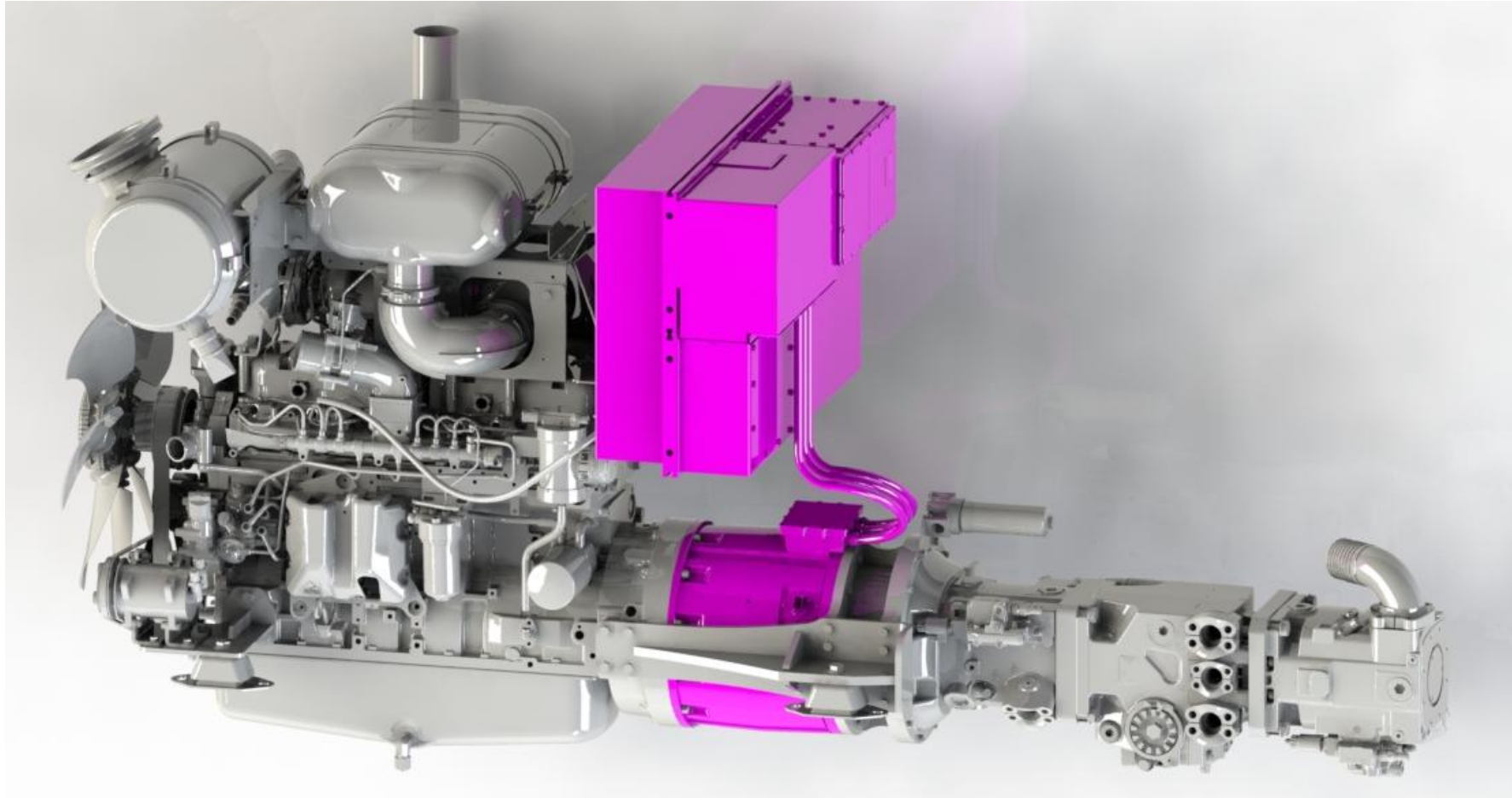


# Layout of the hybrid powerpack





# Layout of the entire hybrid system



# Technical data: Logset 12H GTE Hybrid

## Diesel Engine

- Power at 2100 rpm 205 kW (~280 hp)
- Power at 1900 rpm 220 kW (~300 hp)
- Max torque at 1500 rpm 1200 Nm (~885 ft lb)

## Combined power = Generator + electric motor

- Max Power at 2100 rpm: 175 kW (~240 hp) during 4,5 s
- Power at 1500 rpm: 125 kW (~170 hp) during 6 s
- Max Torque at 100-2100 rpm 800 Nm (~590 ft lb)

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## Hybrid System, engine + electric motor

- Max power at 2100 rpm 380 kW (~510 hp) during 4,5 s
- Power at 1500 rpm 313 kW (~425 hp) during 6 s
- Max torque at 1500 rpm 2000 Nm (~1475 ft lb)

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14

- The hybrid experience -  
Feedback from the field

# Hybrid reviews

Data from the following machines:

- |                  |             |                   |
|------------------|-------------|-------------------|
| ■ #1 – FRANCE    | 3 200 hours | delivered in 2016 |
| ■ #2 – SWEDEN    | 2 700 hours | delivered in 2016 |
| ■ #3 – AUSTRALIA | 1 800 hours | delivered in 2017 |

PRD and DRF files from the machine



# CASE #1 FRANCE: Productivity example

## 1 week of work for the hybrid in France:

- Forest Douglas Fir: 2.200 m<sup>3</sup> slot (2 different forests)
- Average tree size: 2,62 m<sup>3</sup>
- Clearcut: 9-12 m logs + 4 m + 2,5 m
  
- **Machine performance:**
  - 34 motor hours
  - 17 l/h
  - 65 m<sup>3</sup>/h

Fuel consumption  
**0,307 l/m<sup>3</sup>**

## CASE #1 FRANCE: What does it mean in €

- Standard diesel engine → average from **0,8 to 1 l/m<sup>3</sup>**
- Average production of 50 000 m<sup>3</sup> per year
- Hybrid technology **0,5 l/m<sup>3</sup>** VS. conventional diesel engine **0,8 l/m<sup>3</sup>**

**15 000 liters of fuel**

- Fuel price in France has increased from 0,60 to 0,90 €/l on the last 12 months:

@ 0,60€/l = 9 000 € x 5 years = 45 000 €

@ 0,90€/l = 13 500 € x 5 years = 67 500 €



# CASE #1 FRANCE



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19

## CASE 2# FINLAND: Productivity example

- Forest site description:
  - 1,62 m<sup>3</sup>/stem
  - Larch trees in clearcut
- Production: 71,55 m<sup>3</sup>/h
- Fuel consumption: 21,18 l/h

Fuel consumption  
**0,296 l/m<sup>3</sup>**



## CASE 2# FINLAND



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21

## CASE 3# AUSTRALIA: Productivity ex.

### ■ 12H GTE Hybrid running at 1550 rpm

- Production: 44,53 m<sup>3</sup>/h
- Fuel consumption: 17,5 l/h
- Average tree size: 0,4 m<sup>3</sup> per tree

Fuel consumption  
**0,392 l/m<sup>3</sup>**

### ■ 12H GTE Hybrid running at 1725 rpm

- Production: 79,39 m<sup>3</sup>/h
- Fuel consumption: 25,7 l/h
- Average tree size: 0,8 m<sup>3</sup> per tree

Fuel consumption  
**0,324 l/m<sup>3</sup>**

- Taking into consideration that in the second forest the stem size was doubled and less defaults on stems than in the previous forest
- Cutting window: 2 cm
- Peak up to 170 stems/h



## CASE 3# AUSTRALIA



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23



# Summary

Logset, a leader in solutions for sustainable forestry, has developed the world's first hybrid harvester. The Logset 12H GTE Hybrid offers a significant increase in power and torque. The hybrid system is integrated into the diesel engine, and automatically assists it when the harvester needs more power.

The 300 hp diesel engine runs at a constant pace, while the hybrid system provides up to 210 hp of additional power required in a typical felling and processing cycle. This allows the hybrid harvester to easily perform several tasks at the same time, while keeping the engine load constant.





# Vielen Dank für Ihre Aufmerksamkeit!

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25