

Pushing the Boundaries with Research in Forest Engineering  
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# Utilization Rates and Cost Factors in Timber Harvesting based on Long-Term Machine Data

**Franz Holzleitner, Karl Stampfer**

*Institute of Forest Engineering,  
University of Natural Resources and Life Sciences, Vienna*

**Rien Visser**

*College of Engineering,  
University of Canterbury*



# Problem



- Rising harvesting costs drive contractors to force different improvements such as improved cost effectiveness, utilization rates and fuel efficiency
- Lack of detailed data available for cost calculation of mechanized harvesting systems
- Variable quality of data needed for calculation
- Availability of main cost factors – time needed for analysing (just-in-time)



# Objectives



- To improve and update the data used for cost calculation of forest machinery
- Develop and define guideline values for cost calculation in timber harvesting
- To give responsible persons an overview of used machinery with it's costs factors
- Improve and support the decision process for investment in new forest machinery equipment



# Analysis and Calculations

- Source: Enterprise resource planning system from the Austrian Federal State Machine Workshop
- Data collection period : 2004 – 2008

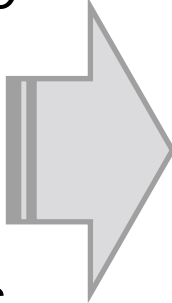
Type	Harvester	Cable Yarder	Skidder	Forwarder
# Machines	12	28	19	18
# Models	4	7	6	6

- Calculations and data collection based on PSH<sub>15</sub>
- Filtering and preparing the data – i.e. consumer price index for cost related factors
- Combining with quantities such as fuel use and considering time limits (12 month for utilization)

# Factors According to FAO-Scheme



*Cost calculation is actually based on the FAO-Scheme combined/adapted with enterprise data*

- *Purchase costs*
  - *Expected useful life*
  - *Technological obsolescence*
  - **Annual utilization**
  - **Repair cost ratio**
  - *Insurance and garage costs*
  - *Interest rate*
- 
- **Utilization barrier**
  - **Depreciation**
  - **Repair cost**
  - **Interest**
  - **Fuel and lubricants**

# Results: Scheduled Machine Hours in AUSTRIA

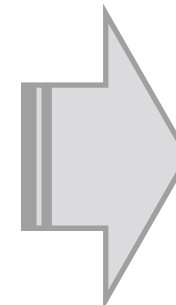


➤ Restriction by law:

- 52 weeks/year with 40 hours/week and worker



<b>Maximum Working Hours</b>	<b>2,080</b>
Vacation and employee's illness (approx.)	- 430
<b>Total Scheduled Machine Hours</b>	<b>1,650</b>

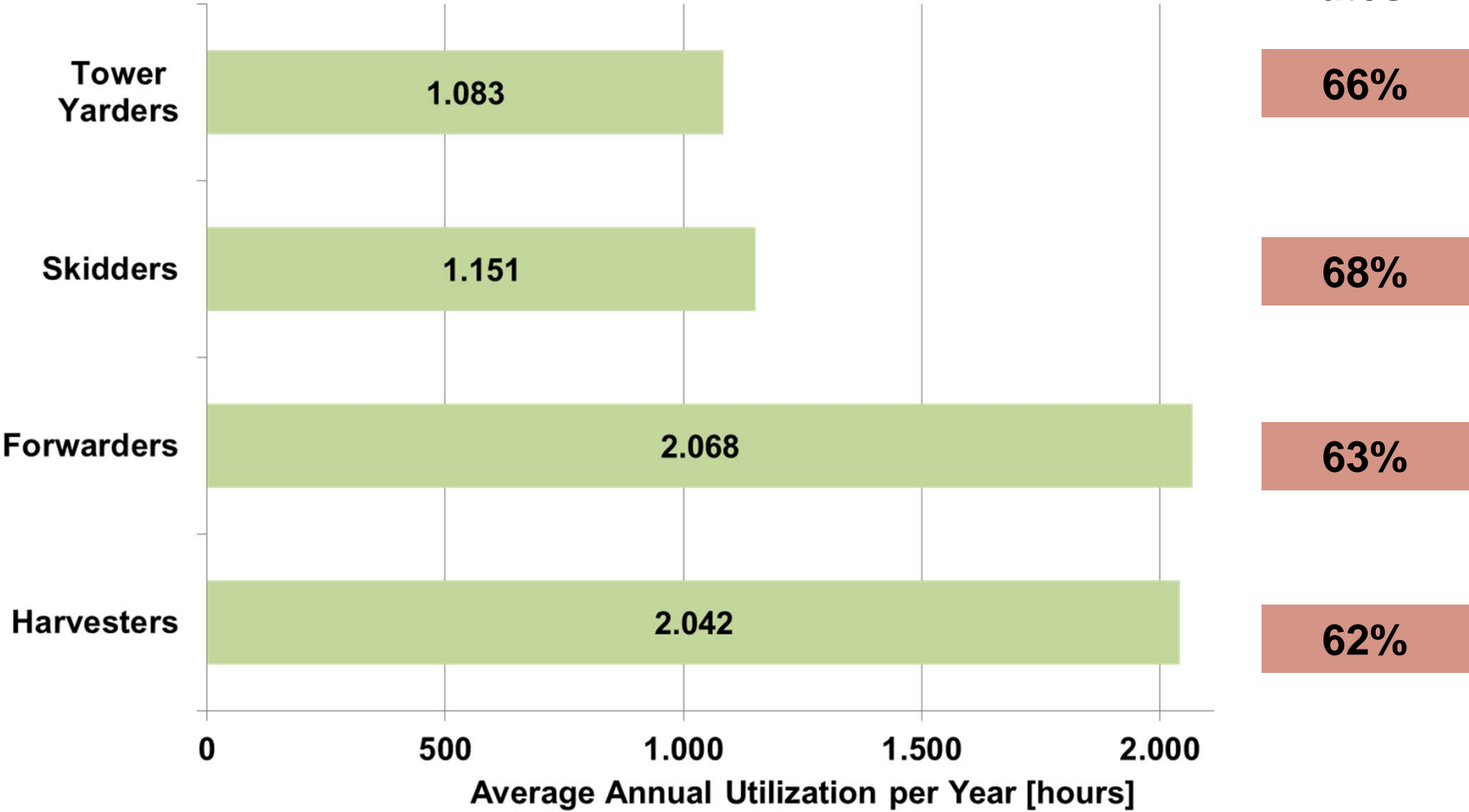


**~1,650 h/year**  
Tower Yarder  
1 shift

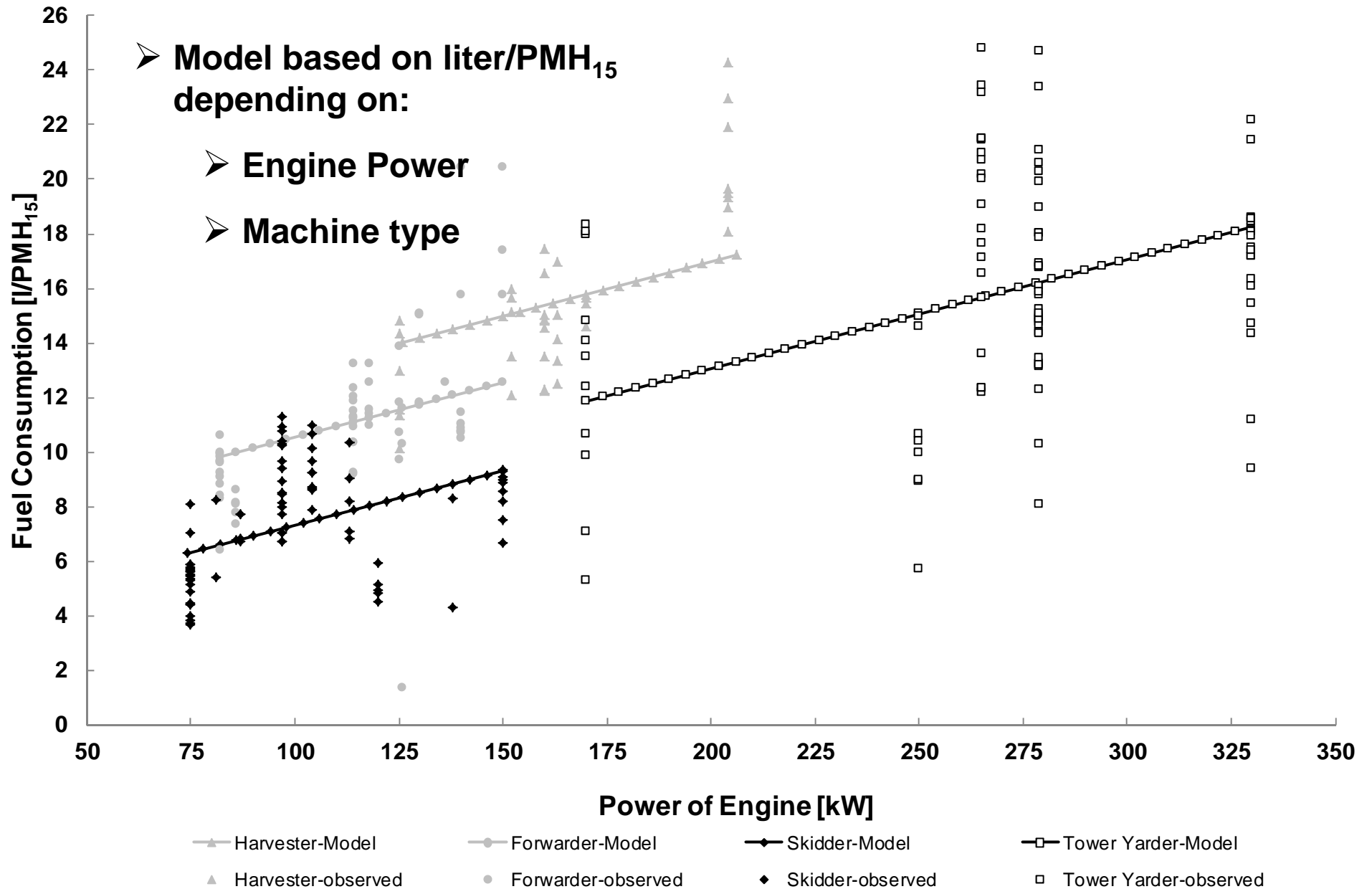
**~3,300 h/year**  
Harvester/Forwarder  
2 shifts

# Results: Utilization Rates

## Utilization -rates



# Results: Fuel Consumption Model





# Results: Additional Cost Factors



	Repair Costs	Lubricants – Perc. of Fuel Costs
Machine Type	[€/PMH <sub>15</sub> ]	[%]
Harvester	20.2	12.6
Forwarder	11.2	7.9
Skidder	11.4	7.2
Tower Yarder	28.0	12.9

# Summary



- Average utilization ranges between 60 and 70%
- Repair costs show high variability between machine types
- Data availability and calculations could be automated using interfaces between ERPs and costing
- Identifying of detailed factors influencing repair costs of forest machines not easy to do



# Outlook



- Data analysis and calculations should be done periodically - supporting the timber harvesting/discussion process
- Identifying of main factors driving harvesting costs could be done more quickly and precisely
- Results support the teaching quality in forest engineering related courses at the institute
- Further studies have to be carried out – including more detailed data collection/analysis



A scenic mountain landscape under a clear blue sky. In the foreground, several large, cut logs are stacked on a rocky, gravelly slope. The logs are arranged in a line, with their circular ends facing the viewer. The background features rolling green mountains and a dense forest of evergreen trees. The overall scene is bright and clear, suggesting a sunny day.

**Thank you for your  
attention!**