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Faculty of Forestry, University of Zagreb

LOAD SPACE UTILIZATION OF FORWARDER VALMET 860.4



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Introduction

- Utilization of loading space has a significant impact on **forwarder transport efficiency**.
- Forwarder loading space is designed for exporting round wood and it is dimensionally adapted that average weight of load is approximately equal to the nominal capacity of forwarders.

Coniferous cultures → CTL method → Optimal utilization

Oak stands → CTQ method → Optimal utilization ??!!!



Introduction

Size of load (mass, volume and length)

- is a parameter that directly affects the productivity of forwarders.
- depends on technical features of the vehicle - size of the loading space and rated load capacity of forwarder.
- significantly affected by dimensions and shape of round logs which are being transported (curvature, expressed root collar, lumps).
- is affected by wood density which is especially obvious during transportation of energy wood.



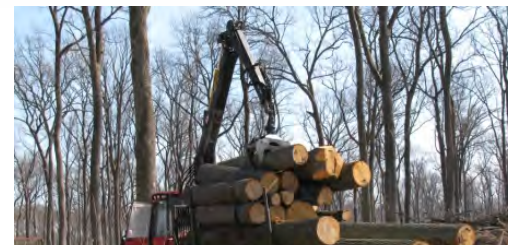
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Objects and methods of research

- Forwarder Valmet 860.4
- Oak stand – final felling - 2 two adjacent forest sections
- 4 different wood products



- rated load capacity – 14 t
- load space volume – 15.83 m³
- load space length – 4.2 m





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Objects and methods of research

- mass of each load was measured by a portable measurement platform
- dimensions (length, mean diameter and volume) of technical roundwood and long firewood were taken from shipping letters.





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Aim of research

Determine the **mass**, **length** and **volume** utilization of forwarder Valmet 860.4 loading space while extracting various wood products from final felling oak stand.



Results

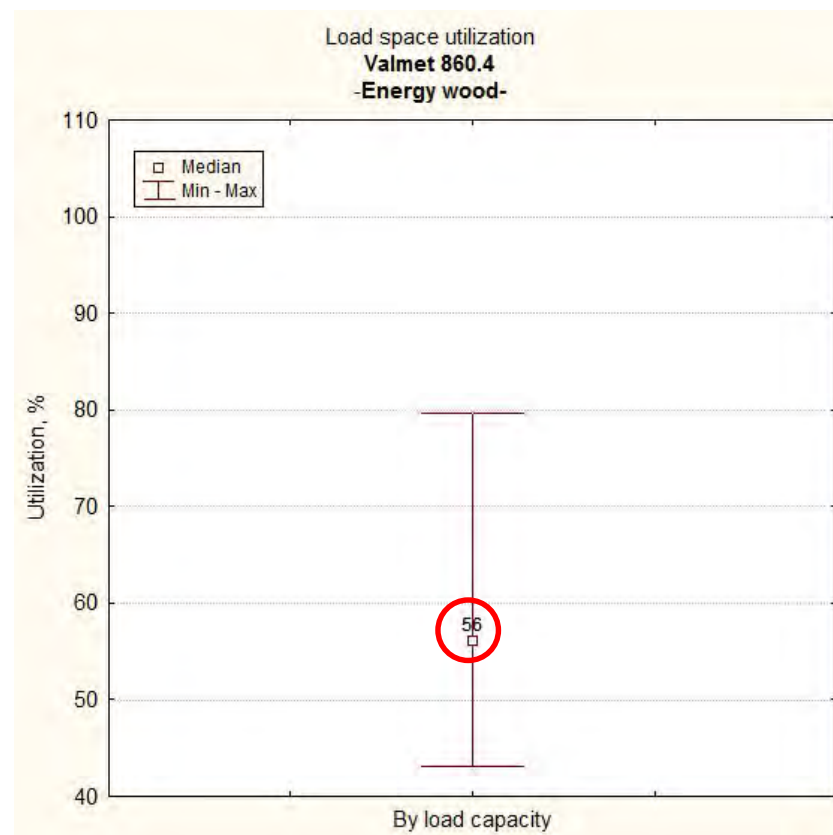
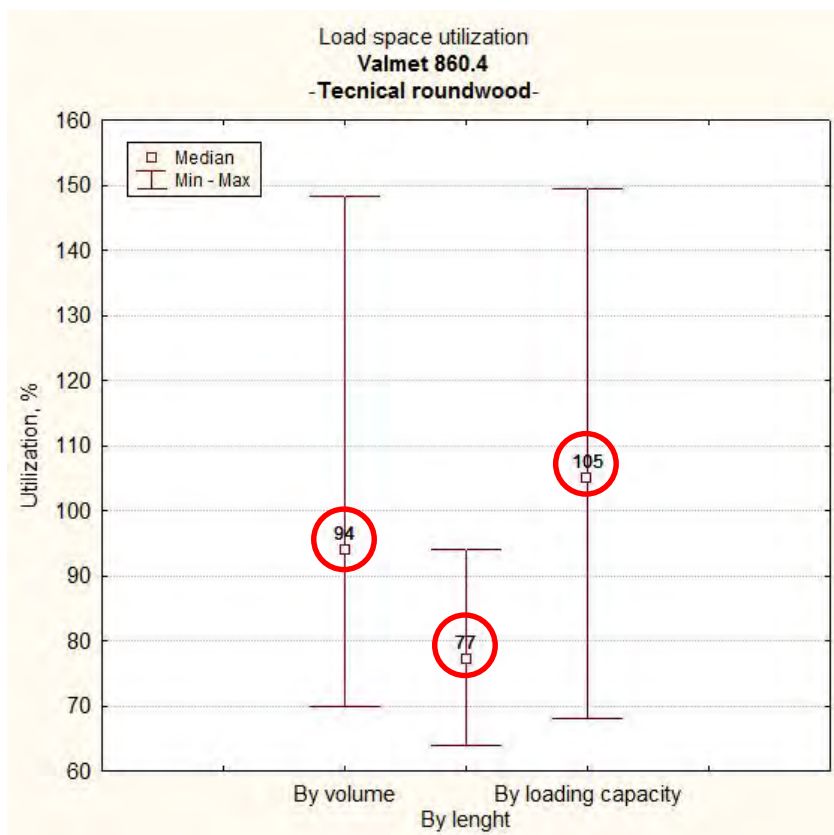
Valmet 860.4	Debrinja 64f ₂						Debrinja 64f ₁							
	Technical roundwood			Energy wood			Technical roundwood and long firewood				Forest residues			
N	57						48			41			6	
	Load mass, kg	N	V,m ³ -bruto	m ³ /piece	L, m	Load mass, kg	Load mass, kg	N	V,m ³ -bruto	m ³ /piece	L, m	Load mass, kg		
Median	14,710	19	14.86	0.80	3.4	7,855	13,770	23	14.17	0.66	3.65	2,925		
Mean	14,689	20	15.08	0.80	3.43	7,996	14,058	23	14.1	0.68	3.71	2,743		
St. Dev.	2,196	5	2.10	0.22	0.27	1,051	2,370	7.6	2.1	0.25	0.36	578		
Minimum	9,540	12	11.05	0.43	2.81	6,030	7,470	13	8.8	0.28	3.03	1,690		
Maximum	20,910	31	23.46	1.40	4.14	11,150	17,700	43	17.46	1.18	4.88	3,250		

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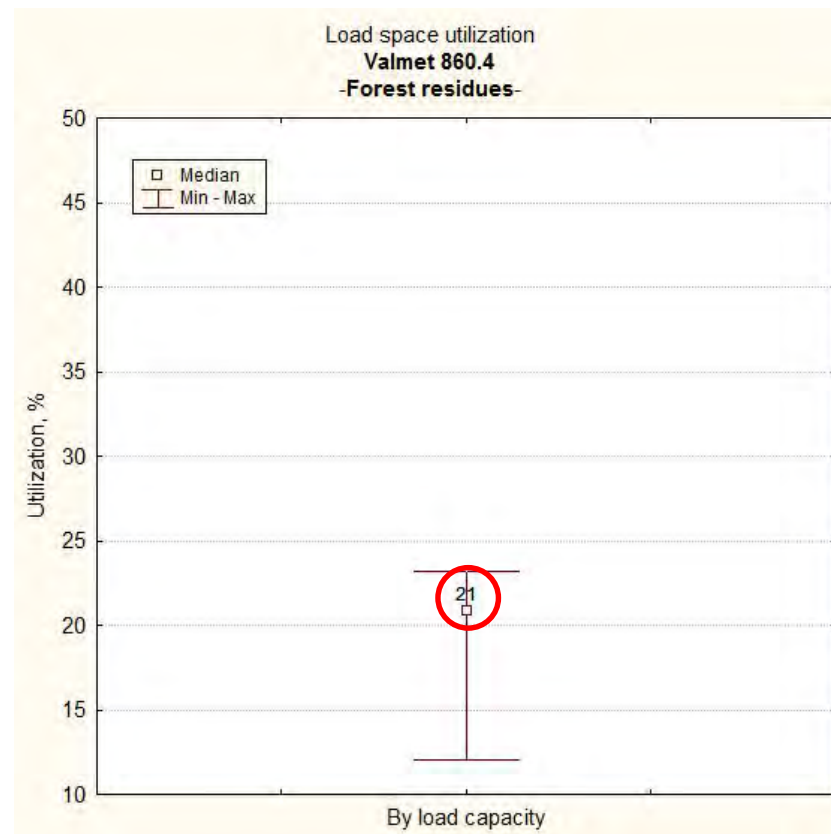
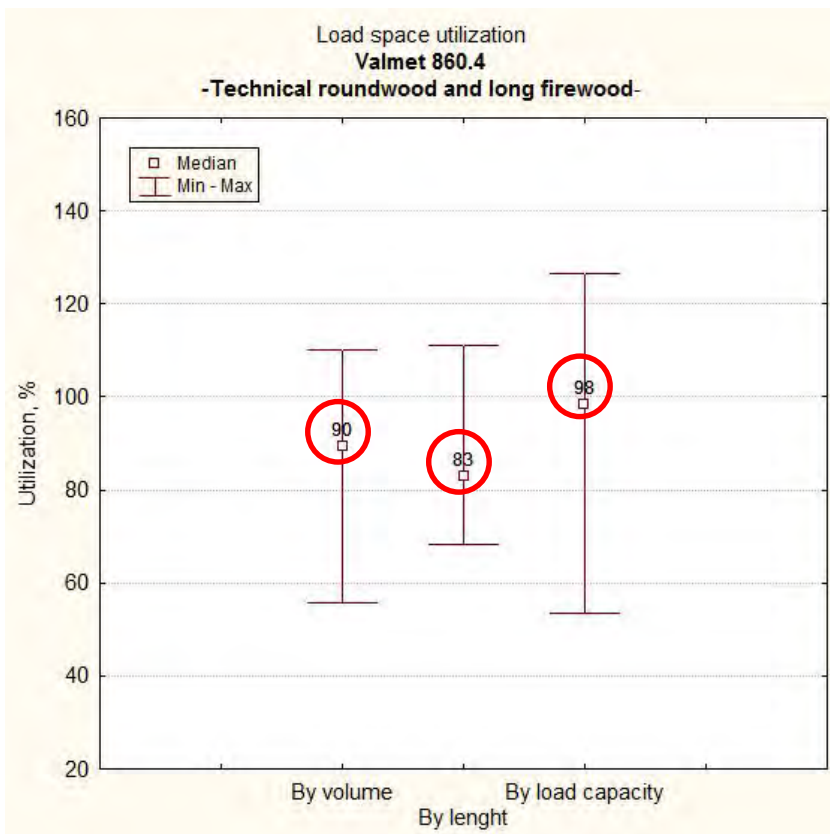
Results





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Results





Conclusions

- While extracting technical roundwood a higher mass utilization was observed but at the same time volume and length utilization was under 100%.
- If assortments were produced by application of cut to length method mass utilization of forwarder loading capacity would be much greater than in this research (105%).
- If a forwarder for the oak assortments extraction was constructed its loading space could be shorter on average by approximately 15% while maintaining the same nominal capacity. The next solution is to increase the rated capacity forwarder while maintaining current dimensions of the loading space.
- During energy wood extraction, mass utilization of forwarder Valmet 860.4 nearly half of its nominal capacity,
- During extraction of forest residual, mass utilization was only 21% and the profitability is questionable extracting it by forwarder.



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Thank you for your attention!