### Impact of feed rollers on productivity, log damages and fuel consumption during harvesting



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IEGULDĪJUMS TAVĀ NĀKOTNĒ

### Background – losses in log quality





### Damaged poles





## Scope of the study



- The aim of the study is to compare the standard side feed rollers of the harvester head with the Moipu Flex Standard side feed rollers, by evaluation of the depth of the imprints depending on the type of felling, tree species and type of assortment.
- During the study data were obtained in commercial thinning using John Deere 1070E harvester and in regenerative felling using John Deere 1270E harvester.

### Organization of experiment





### Measurement plan – assortments and logs



Felling type	Season	Assortment types						
		spruce			pi	birch		
		6x10	10x14	14x18	10x14	14x18	veneer	
Regenerative felling	winter	80	80	80	80	80	80	
	summer	80	80	80	80	80	80	
Thinning	autumn	80	80	80	80	80	80	
	spring	80	80	80	80	80	80	
	summer	80	80	80	80	80	80	



### Calculation of depth of imprints



- Depth of imprints is calculated for the stem cylinder:
  - stem cylinder = thin end diameter minus 1 cm.

#### Measurements in the field







### Number actually measured logs



Species	Assortment	Moipu feed rollers			Standard feed rollers				
		spring	winter	summer	autumn	spring	winter	summer	autumn
Regenerative felling									
Birch	FIB	-	79	78	-	19	-	32	-
Spruce	10x14	-	72	152	-	21	-	66	-
	14x18	-	87	104	-	18	-	80	-
	6x10	-	-	1	-	-	-	16	-
Pine	10x14	-	60	26	-	1	-	21	-
	14x18	-	83	126	-	1	-	53	-
Commercial thinning									
Bērzs	FIB	-	-	-	-	-	-	-	10
Egle	10x14	19	-	204	79	11	-	23	67
	14x18	25	-	98	83	3	-	23	17
	6x10	10	-	127	48	7	-	3	-
Priede	10x14	65	-	126	97	16	-	-	-
	14x18	41	-	92	94	17	-	-	-

# Veneer logs in regenerative felling – logs with imprints affecting log quality



Season	Feed rollers	Тор	Center	Bottom
Winter	Moipu feed rollers	91%	8%	1%
	Standard feed rollers	76%	12%	12%
Summer	Moipu feed rollers 62%		26%	11%
	Standard feed rollers	64%	25%	11%



## Spruce logs in regenerative felling (14x18 and 10x14 cm)



Assortment type	Season	Feed rollers	Тор	Center	Bottom
14x18	winter	Moipu feed rollers	98%	2%	-
		Standard feed rollers	95%	5%	-
	summer	Moipu feed rollers	90%	8%	2%
		Standard feed rollers	86%	12%	2%
10x14 winter		Moipu feed rollers	97%	2%	-
		Standard feed rollers	100%	-	-
	summer	Moipu feed rollers	87%	6%	6%
		Standard feed rollers	88%	9%	3%



# Spruce logs in commercial thinning (14x18 and 10x14 cm) with significant imprints



Assortment type	Season	Feed rollers	Тор	Center	Bottom
14x18	winter	Moipu feed rollers	80%	18%	2%
		Standard feed rollers	88%	12%	-
	summer	Moipu feed rollers	93%	6%	1%
		Standard feed rollers	81%	19%	-
10x14	winter	Moipu feed rollers	85%	13%	2%
		Standard feed rollers	72%	25%	3%
	summer	Moipu feed rollers	91%	9%	-
		Standard feed rollers	88%	12%	-

# Impact of Moipu (side) feed rollers and debarking rate in thinning – spruce logs



Season	Assortment	Feed rollers	Average depth of imprints, mm	Maximal depth of imprints, mm	Share of logs with deeper imprints of side feed rollers, %	Average bark thichness, mm	Share of debarked areas, %
Summer	14x18	Moipu	5,73	11,35	85%	3,03	59%
		Standard	7,34	10,14	70%	2,89	70%
	10x14	Moipu	5,90	11,35	69%	2,75	42%
		Standard	5,90	10,14	91%	2,23	83%
Autumn	14x18	Moipu	5,37	9	61%	4,11	13%
		Standard	8,42	11,7	100%	4,47	100%
	10x14	Moipu	5,30	9,69	74%	4,04	5%
		Standard	6,66	13,95	97%	3,80	100%

### Summary – depth of imprints



## Conclusions



- Moipu feed rollers significantly reduces depth of imprints, but the additional pressure caused by the central feed roller significantly worsens the quality of the assortments.
- The effect of Moipu feed rollers is also diminished by the feed roller splines, which increase the depth of wood damage.
- This type of damages can be significantly reduced by proper regulations of pressure in felling head.
- Use of the Moipu feed rollers lead to reduction of debarked area of logs thus potentially increasing storage time of logs in summer.
- Positive impact of Moipu feed rollers express more significantly during production of small diameter logs.

### Questions to clarify



Efficient service time of Moipu feed rollers, factors affecting it and performance during life time

#### Possibilities to reduce damages by central feed roller

Reduction of impact of operator's experience on the damages in different stands *(seasons, dimensions and species of processed trunks)* 

Verification of the impact on log quality and differentiation of price for logs produced with Moipu feed rollers

### Thank you for attention!

Pētījums veikts a/s "Latvijas valsts meži" un LVMI Silava 2011. gada 11. oktobra memoranda "Par sadarbību zinātniskajā izpētē" ietvaros

LATVIJAS VALSTS MEŽI