



16th International Scientific Conference WoodEMA 2023

Current Trends and Challenges
for Forest-Based Sector:
Carbon Neutrality and Bioeconomy



Technical University in Zvolen



Faculty of Wood
Sciences and
Technology



Comparison of Calculation Procedures for the Production of Recycled Wood-plastic Products in the Context of Circular Economy Principles

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Circular Economy and Wood Plastic Composite

LINEAR ECONOMY

Materials in a **Linear Economy** create waste after use.



VS.


CIRCULAR ECONOMY


Materials in a **Circular Economy** are collected and reused after each use.




Material and Methods

Business plan

 WPC with dimensions of 2,500 x 1,250 x 20 mm (height, width, thickness) and a weight of 48.5 kg

 wood material: 40%, HDPE (High Density Polyethylene)+additives: 60%

 line to production 1,600 kg/Hour

 in 8 hours shift with 87.5% capacity a total annual output is 2,800 tonnes

Pulverizer



300 000 €

Homogenizing silo



48 000 €

Drum Dryer



30 000 €

Cladding Machine



620 000 €

Auger conveyor



34 000 €

Material and Methods

Traditional Calculation

Material Cost (sawdust)
+ Material Cost (HDPE and additions)
+ Labor Cost
+ **Overhead Production Cost**
= Total Production Cost
+ **Administrative and Sales Overhead Cost**
= Total Own Cost of Product
+ Profit Margin (20%)
= Price without VAT

Traditional Surcharge Calculation

$$\frac{\text{Production Overhead Cost} \times 100}{\text{Direct Material}}$$

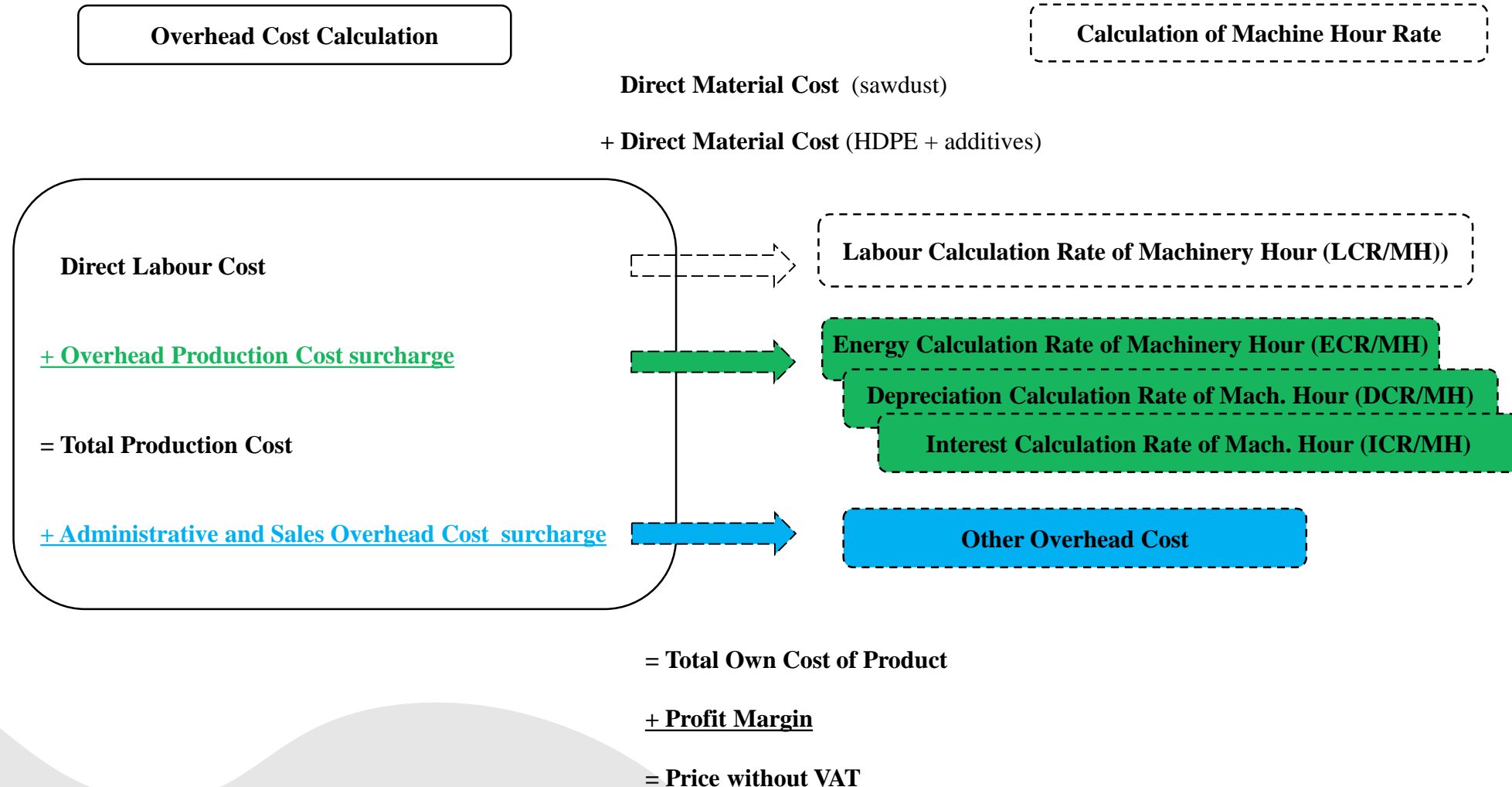
$$\frac{\text{Other Overhead Cost of Company} \times 100}{\text{Total Production Cost}}$$

Result and Conclusion

Final Calculation of Overhead Cost Calculation

Calculation item	Calculation Unit (€/1 ton of mixture WPC)
Material Cost - sawdust	22.00
+ Material Cost - HDPE and additives	372.00
+ Labour Cost	53.54
+ Overhead Production Cost (18.67%)	73.59
= Total Production Cost	521.13
+ Administrative and Sales Overhead Cost (5.73%)	29.86
= Total Own Cost of Product	550.99
+ Profit Margin (20%)	110.20
= Price without VAT	661.19

From Traditional to Innovative Calculation Method



Final Calculation of Machine Hour Rate

Calculation item	Notes to calculation	Calculation Unit (€/1 ton of mixture WPC)
Material Cost - sawdust	22 €/ton	22.00
+ Material Cost (HDPE and additives)	620 €/ton	372.00
+ Labour Cost Rate/MH	LCR 85.66 €/MH Labour Cost Rate / Machinery Hour	53.54
+ Energy Cost Rate/MH	ECR 17.01 €/MH Energy Cost Rate / Machinery Hour	10.63
+ Depreciation Cost Rate/MH	DCR 98.29 €/MH Depreciation Cost Rate / Machinery Hour	61.43
= Total Production Cost		519.60
+ Other Overhead Cost	surcharge 55.8% Other Overhead Cost/Direct Labour Cost) × 100	29.87
= Total Own Cost of Product		549.47
+ Profit Margin	20%	109.89
= Price without VAT		659.36

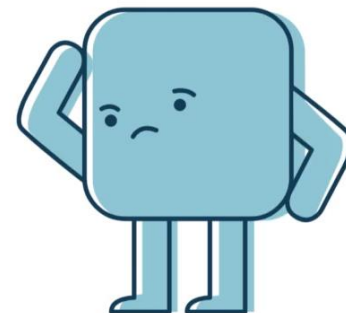
Result and Conclusions

Overhead Cost Calculation

661.19 €/ton

Machine Hour Rate Calculation

659.36 €/ton



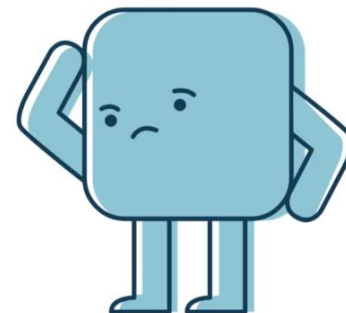
Result and Conclusions

Overhead Cost Calculation

661.19 €/ton

Machine Hour Rate Calculation

659.36 €/ton



Prospects for Future Research

Dissertation thesis

Economic Complexity and Calculations in the Manufacture of a Product from Recycled Raw Materials Wood-Plastic in the Context of Circular Economy Principles

UNIVNET

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Thank you for your attention



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