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CONVENTIONAL VS. INNOVATIVE METHODOLOGICAL COSTING PROCEDURE FOR THE PRODUCT MANUFACTURE FULFILLING THE PRINCIPLES OF THE CIRCULAR ECONOMY

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ABSTRACT

Innovative products, including wood plastic composite, point to the potential of using the principles of the circular economy. The increasing share of plastic waste combined with wood raw material creates great potential for meeting the environmental criteria of wood plastic composite products. The aim of the paper is to present a proposal for modifications of the standard methodological overhead cost calculation with the subsequent comparison of the results of the innovative methodological calculation, based on the investment plan for the production using recycled wood-plastic raw materials. The application of the Calculation of Machine Hours Rates requires precise identification of the production capacity in terms of machinery hours and composition of the calculation formula. Although the results of the comparison of price differentiation did not reveal a fundamental change in the cost allocation, it may differ for variations in other surface and volume product dimensions, changed wood-plastic component proportions or subsequent final surface treatment.

Keywords: circular economy; wood plastic composite; calculation; cost; price.

INTRODUCTION

For thousands of years, people have been connected with nature and the changing cycles of the seasons. It was not until the middle of the 18th century that a gradual transformation from an agrarian society to an industrial one occurred. The transformation was long and demanding (Özçatalbaş, 2022). Rapid technological development, following the industrial revolution and especially in the period after the Second World War, contributed to the rapid increase in wealth (Lowitt *et al*., 2009), but also to the population boom. This fact has led to the idea of the infinite availability of resources, materials, and products. The illusion of the infinity of resources was the cause and consequence of the development of a linear economy (Bonciu, 2014). The linear model was and still is understood as an open economic model, the production of which is oriented towards the consumption of primary raw materials, goods and capital goods that excessively produce consumption in the future. Several foreign authors and international institutions have dealt with the characteristics of the linear model. For example, Rizos *et al*. (2016); Ellen Macarthur Foundation (2017); Pichelin (2018); Fura *et al*. (2020); Nikolaou and Tsagarakis (2021); Sharma *et al*. (2021) agree that the linear model of the economy is characterized as a traditional model of consumption and reflects consumerism and materialistic way of life that has its limits. In fact, since the industrial revolution, the linear production model has dominated the global industrial system (Sakthivelmurugan *et al*., 2022). According to Ghisellini and Ulgiati (2020), the linear economy has long been understood as a conventional system impeding sustainable development and, unfortunately, permanently damaging the environment. It is focused only on the procurement of raw materials, their transformation into a finished product and subsequent disposal. It does not consider value recovery from the final product cycle. Thus, the environmental burden on mankind has been constantly accelerating since primary industrialization.

The year 1970 was the last year when the needs of mankind corresponded to the possibilities provided by the Earth (Global Footprint Network, 2022). Bonciu (2014) in his report stated that in 2010, the point was reached when the total needs exceeded the regenerative capacity of the Earth by more than 50%. For comparison, in 1961 (first available data), "only" 73% of the Earth´s capacity resources were exhausted, while it was already 160% in 2020. Thus, for more than 50 years, we have been living on ecological debt, so called Earth overshoot day, which is referred to as the day when the natural resources that the planet is capable of recovering in one year have been exhausted (Zibura, 2019). If the use of resources continues at the current rate, we would need more than three planets to meet our needs by 2050. With this tendency, annual waste production is estimated to increase by 70% by 2050 (European Commission, 2020). The environment will suffer huge damage. This unsustainable model of overuse and irrational use of resources means prioritizing short-term economic gains over long-term ones (Baranski, 2021). The growing pressure to protect the environment and the awareness of resource limitations have created the conditions for the concept and principles of the circular economy (CE).

The circular economy is a relatively new term, but not the concept itself. It is based on some previous models and theories, such as industrial ecology, biomimicry, blue economy, the philosophy of Cradle to Cradle or the 3R theory (Reduce, Reuse, Recycle), which contributed to its development (Wautelet, 2018). The CE concept can hardly be defined to a specific date, attributed to a particular author or one school of thought. The term CE consists of two general terms: "circular" and "economic". The term "circular" suggests that products and services should be arranged in a way that slows, narrows, and closes the so-called loop of materials and resources within production processes. The term "economic" is aimed at aspects such as production processes, finances, and management results (Nikolaou and Stefanakis, 2022). Many authors address the essence and possibilities of using the principles of CE in the industrial sector. Urbinati *et al*. (2020) investigate and present peculiar managerial practices to create and capture value in circular business models, and highlights the need to conceive a systemic perspective on the implementation of these practices, especially for manufacturing companies. Sergio *et al*. (2022) draw attention to the benefits of CE principles for sustainability and represent a big opportunity for manufacturing enterprises to reduce costs and take economic advantages. This opinion is also confirmed by Acerbi and Taisch (2020).

For the CE model, wood raw material seems to be the ideal input material for innovative products. This is evidenced by the results of studies by Parobek *et al*. (2019) and Paluš *et al*., (2020), who presented a comparison of different scenarios of industrial wood utilization in Slovakia and the resulting impacts on the national carbon balance. Wood is the traditional and the only renewable resource in our conditions with a positive impact on the environment. Forests capture CO2 from the atmosphere by photosynthesis and store carbon in biomass, which has been maintained in wood products for decades (Andersen 2007). Another benefit in mitigating the effects of climate change is associated with lower emissions of CO2 and other pollutants when using wood compared to alternative materials (Eriksson *et al*. 2012). Wood can be varied into many products, and at the end of their life cycles, these products can be recycled or used as an energy source. The increasing volume of plastic waste (with a specific focus on the automotive industry) also creates the potential for its use in the form of innovative products – wood plastic composites (WPC). There are several interesting studies on this issue. In the study of Basalp *et al.* (2020), the use of municipal plastic and wood waste for the industrial production of potential WPCs was examined. Ramesh *et al.* (2022) dealt with the recycling of wood from building and demolished structures and its combination with plastics. Previous studies point to the environmental dimension of WPC production. Another example is the study of the environmental impacts of the composite pallets production made from wood and plastic waste from construction and demolition works in Finland (Khan *et al.*, 2021) or the study by Turku *et al.* (2017). In domestic conditions, the issue was addressed by prof. Sedliačik (Lyuty *et al.*, 2019) and Čabalová *et al.* (2021). WPC is a type of composite material that uses thermoplastic polymers as a matrix: in particular polyethylene – PE, polypropylene – PP, polyvinyl chloride – PVC, wooden components (sawdust, shavings, chips, bamboo and others) as a filler (Chan *et al.*, 2018). Additives (binders, antioxidants and UV stabilizers) are also added to the mixture. The proportion of the wood component depends on the manufacturer and technology. For example, wood-plastic boards are produced through the process of hot extrusion, pressing and injection moulding (Böhm *et al.*, 2012).

The WPC manufacturing sector has grown rapidly in recent years. According to Coherent Market Insights (2022), the WPC market was estimated at 5.84 billion USD in 2021 and by the end of 2028, it shall exceed revenues of 12.99 billion USD. North America and China are the two major producers, while Europe is the third largest. The most common product categories in this specific sector are deck boards, cladding, fencing and components for the automotive industry. In recent years, Market development has also been affected by rising oil and monomer prices (Fig. 1), which has increased filler costs.

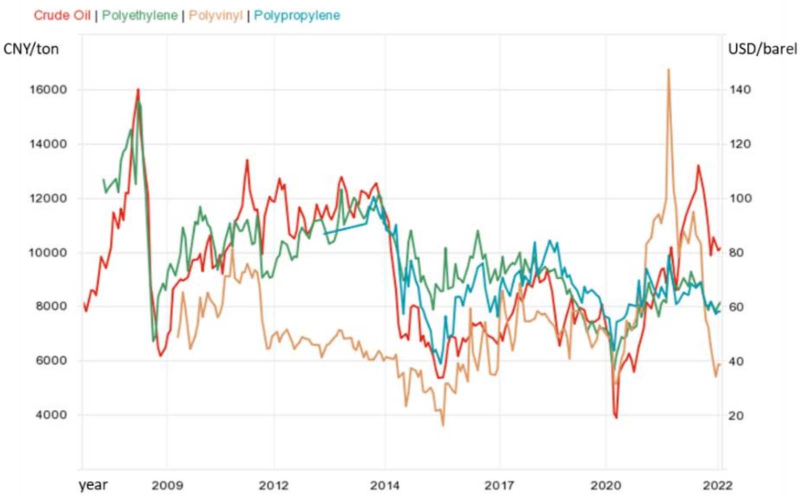

Fig. 1 Development of oil prices USD per barrel and thermoplastic polymers CNY/ton (polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC))
Source: https://tradingeconomics.com/commodity/crude-oil

WPC with a unique combination of wood and plastic has a good module of elasticity, and fibrous parts mixed with plastic have better compression physical and mechanical properties than alternative products (Clyne and Hull, 2019). Compared to natural wood, the hardness of the surface is 2-5 times higher than that of ordinary wood. In interior applications, WPC has good ultraviolet light stability, colour, adjustable performance, etc. However, in outdoor WPC applications, long-term exposure to ultraviolet radiation and humidity leads to fading and reduction of its physical properties (Xu *et al*., 2021). The production of such a product requires certain innovations. Product and process innovation is a common part of a comprehensive approach that includes their improvement and, in particular, the investments that innovations require (Valencia *et al*., 2020). A successful process of investment feasibility is conditioned by a quality investment project (IP). The elaboration of IP based on the input information database and its subsequent evaluation is an essential part of the assessment of the economic intensity of production. Several recommended methods and procedures can be applied. Several authors have already dealt with this issue, and the following studies are recommended: (Weytjens *et al*., 2021; Tuovila, 2021; Patrick and French, 2016; Merlo, 2016; Kassay, 2015). Partial proper results on the issue, which presented the concept of a business plan for WPC production, can be obtained in the study by Osvaldová and Potkány (2021).

In terms of the input database for IP preparation, it is necessary to focus not only on the issues of project evaluation, but also on the identification of the target group of customers, proposals for sales support, and especially the economic intensity conditioned by methodological sales price procedures. This is a very important area that has a reasonable impact on the efficiency of future production (Halaj *et al*., 2018; Malá *et al*., 2017). It is the choice of the calculation methodology that requires a very flexible approach in the current turbulent price changes (procurement prices of technology, purchase prices of materials and energy) and difficult predictable estimates. Calculations are an important tool to provide information on competitiveness in terms of price, while costs are the most important calculation category. Many authors (Nishimura, 2018; Drury, 2012; Scholleová, 2009) consider the costs to be a monetary valuation of the consumption of production factors incurred by an enterprise for its performance and other purpose-related expenses associated with its activities. Naturally, every enterprise is interested in knowing the cost structure per product unit. The calculation process specifies the costs. The enterprise compiles calculation procedures according to its specific conditions given by the nature of production, experience and specifics of the industry (Potkány and Krajčírová, 2015). According to many available classifications, it is generally possible to talk about traditional calculation techniques (Division Costing, Overhead Cost Calculation) and also innovative techniques (Activity Based Costing, Variable Costing, and Calculation of Machine Hours Rates). Authors who have partially or comprehensively dealt with the issue (Schiff and Buzinkai, 2021; Král *et al*., 2018; Taušl and Jelínková 2018; Popesko and Papadaki, 2016) point out the advantages and disadvantages of selected calculation techniques. Unfortunately, the review of available domestic and especially foreign sources revealed the fact that there is more attention paid to the content than to the practical side within the comparison of calculation techniques. In addition to the above-mentioned sources, the following studies are also involved (Țîrlea, 2022; Sihombing, 2016; Dima, 2013). Some indications of economic benefits from the use of CE principles, but without a more accurate calculation, were presented by Basalp *et al*. (2020) and Urbinati *et al*. (2020). Therefore, it is possible to identify a research gap in managerial sciences in the given area, also in connection with the calculation techniques using CE-compliance products.

The aim of the paper is to present a proposal for modifications of the standard cost calculation methodology with the subsequent comparison of the results with the innovative methodological calculation procedure, based on the investment plan for the production based on the use of recycled wood-plastic raw materials. Since the review of available data revealed a research gap in the given area, the presented proposals and results, in particular using the Calculation of Machine Hours Rates, shall initiate a future discussion and comparison of similar results of the issue.

MATERIALS AND METHODS

Selected Slovak universities and the Automotive Industry Association of the Slovak Republic are looking for vehicle waste recovery solutions in innovative products. The project also includes research that takes place at the Technical University in Zvolen, including the assessment of the production of composites containing wood and waste plastic or recycled tyres (rubber waste).

The main subject of research concerning economic intensity is a product based on the use of recycled wood-plastic raw material, namely WPC with large dimensions of 2,500 mm – 1,250 mm – 20 mm (height, width, thickness) and a weight of 48.5 kg. The investment plan identified a technological line for extruding WPC profiles (Fig. 2) as a suitable technological procedure, including the acquisition prices. The total acquisition level was quantified at €1,032,000 and the depreciation amount was determined to €172,000 by applying the linear method. The capital structure of the financing presented the ratio of 70% foreign capital and 30% EU structural funding. The technological line consisted of a pulverizer, homogenizing silo, drum dryer, cladding machine and an auger conveyor. Production capacity - the output of the extrusion line mixture is predicted at the level of 1,600 kg/h, which means that during an 8-hour shift, using 87.5% capacity, it would be possible to produce 11,200 kg of the mixture (annual capacity of 2,800 tonnes). This data can be used to model the structure of cost items using a type calculation formula.

Fig. 2 Acquisition prices of the components of the technological line for the production of WPC
Source: Own processing according to www.wanrooetech.com; www.segopaltech.cz1; www.segopaltech.cz2; www.tongsanmachine.com; www.segopaltech.cz3

The structure of the type calculation formula for the application of the traditional overhead cost calculation is in the context of the recommendations of many theoretical sources (Král *et al*., 2018; Coenenberg *et al*., 2016; Potkány and Krajčírová, 2015; Popesko, 2009; Däumler and Grabe, 2002), but also practical applications in the production of similar products, as follows:

Direct Material Cost (sawdust + plastic waste + additives)
+ Direct Labor Cost
+ Overhead Production Cost (OPC)
= Total Production Cost
+ Administrative and Sales Overhead Cost (ASOC)
= Total Own Cost of Product
+ Profit Margin
= Price without VAT

For the allocation of overhead costs, it is necessary to consider the financial forecast of the business plan identifying the group and the overhead cost values (Tab. 1). Subsequently, in the items of production, administrative and sales overheads, using type allocation bases, it is possible to determine the rates of overhead cost. The surcharges present mathematical relations 1 and 2. The disadvantage is the application of the principle of averaging overhead costs.

Tab. 1 Input information on the cost structure.

Identification of overhead costs from the basis of the financial forecast of the investment project for the production of wood plastic composite	
Cost Item - specification	Value (€)
Material Cost (components of product with capacity regulations)	1,103,200 €
Labor Cost (additional labor costs caused by the investment – 6 employees)	149,910 €
Energy Cost (additional technological energy costs caused by the investment)	34,020 €
Depreciation (linear method respecting the lifetime of the technology of 6 years and the purchase price)	172,000 €
Other Overhead Cost (administrative cost, control, management and sales)	83,654 €

Source: Osvaldová and Potkány, 2021

$$\text{Overhead Production Cost surcharge} = \frac{\text{Production Overhead Cost} \times 100}{\text{Direct Material}} \quad (1)$$

$$\text{Administrative and Sales Overhead Cost surcharge} = \frac{\text{Other Overhead Cost of Company} \times 100}{\text{Total Production Cost}} \quad (2)$$

Material cost refers to the input components (wood-plastic waste, binders and UV stabilizers). WPC is based on HDPE (high-density polyethylene). To calculate the gross conversion calculation of the final product cost, the estimated ratio of input raw materials per 1 tonne of the mixture in the ratio of 40:60 is taken into account. Where 40% is wood sawdust and 60% is HDPE plastic granulate (together with an undetermined ratio of the classified formula of UV stabilizers and colourants, the financial intensity of which is though included in the item). According to the production company, this ratio of raw materials was selected to achieve an expected homogeneous mixture for the next extrusion process. It is assumed that if the materials have the same ratio, there will be suitable binding between the (Horta *et al.*, 2017). Direct labour cost represents additional costs incurred by the investment with the need to operate the proposed technology in the number of 6 employees at the level of gross wage + social security and health insurance contributions of the employer. Other costs are simply allocable using surcharges per calculation unit. The given calculation formula is the starting point for the design of adjustments resulting from the innovative methodological procedure of calculating using the Calculation of Machine Hour Rates.

In the following comparison of both calculation procedures, the same profit margin level (20% as the industry's average level of Return on Cost) was used. At the same time, this surcharge also includes a certain margin to cover unforeseen overhead costs, as well as a reduced level of capacity utilisation at the start-up stage.

Based on the defined objective of the paper, it was possible to formulate research questions (RQ) in the following wording:

RQ1: What specific cost groups and schedule baselines are necessary to include within the calculation formula of the traditional surcharge calculation in the design of methodology adjustments for the Calculation of Machine Hour Rate?

RQ2: Will the price difference with the use of the Calculation of Machine Hour Rate reach a level that affects the minimum level of profit margin based on the cost profitability of the industry?

RESULTS AND DISCUSSION

Based on the 1 and 2 relationships referred to in the methodology, the Overhead Production Cost surcharge was quantified at 18.68% (with allocation base Direct Material). The administrative and Sales Overhead Cost surcharge was quantified at 5.73% (with allocation base Total Production Cost). While respecting the set limits of production capacities and the resulting values of direct and overhead costs, as well as the maintained ratio of WPC input components, the methodological procedure of traditional surcharge calculation was applied (Tab. 2). Important cost items are material costs, which are priced at the in-house price level in case of wood waste and at the market price level in case of plastic waste and additives.

Tab. 2 Final Calculation of Traditional Calculation.

Calculation item	Calculation Unit (€/48.5 kg WPC)	Calculation Unit (€/1 ton of mixture WPC)
Material Cost - sawdust	1.07	22.00
+ Material Cost - HDPE and additions	18.04	372.00
+ Labor Cost	2.60	53.54
+ Overhead Production Cost (18.67%)	3.57	73.59
= Total Production Cost	25.28	521.13
+ Administrative and Sales Overhead Cost (5.73%)	1.45	29.86
= Total Own Cost of Product	26.73	550.99
+ Profit Margin (20%)	5.34	110.20
= Price without VAT	32.07	661.19

Source: Own processing

The offer sales price of WPC of the assumed dimensions, determined by the preliminary gross conversion surcharge calculation, is at the level of approximately €661.19/tonne excluding VAT and, for the given dimensions per calculation unit €32.07 excluding VAT.

Traditional calculation methods provide a wide range of application possibilities, but due to changing cost structure conditions and production automation, they are limited in terms of the accuracy of information provided. In the surcharge calculation, the aforementioned factor of preference for the principle of averaging contributes to this. (Král *et al*., 2018; Popesko and Papadaki, 2016). While the share of production wages as a direct cost, decreases over time, the overhead costs associated with the machines used in generating outputs increase significantly. The use of the surcharge calculation arises the question of whether production wages and materials can continue to constitute an appropriate allocation basis for the redistribution of the costs of production overhead. The increasing level of technology and the resulting change in the cost structure also emphasize this fact. Wöltje (2016); Mumm (2015) pointed to this problem in their studies. This issue shall be addressed due to the changed conditions. The question is, how to maintain the principle of causality as much as possible and how to increase the accuracy of the calculation, when there is still a requirement to use overhead cost calculation. The Calculation of Machine Hour Rate is one of the solutions. It is a specific form of surcharge calculation focused on a more precise allocation of overhead costs. It is an ideal method of allocating the production costs of the technological nature of production with the dominant use of machinery compared to the receding share of manual labour. A visual change in the innovative Calculation of Machine

Hour Rate (CMHR) methodology compared to the traditional Overhead cost rate is presented in Fig. 3.

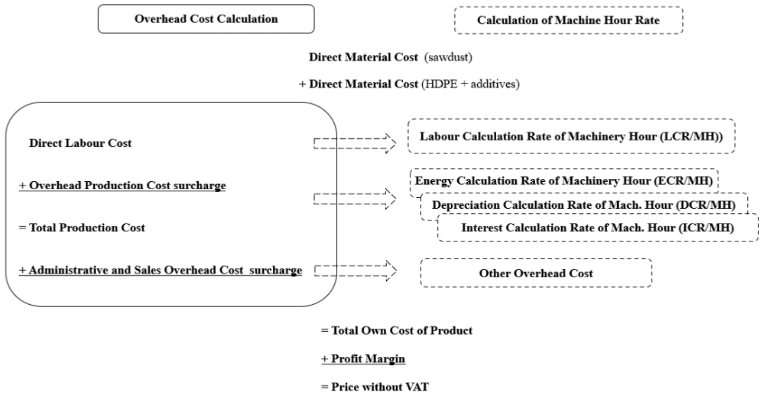

Fig. 3 Proposal for a change: traditional versus innovative calculation.
Source: Own processing

Within the research question RQ1, it is obvious that the calculation formula of the traditional calculation will need to be extended by several cost items using the machine hour rate allocation base. Information on the considered production capacity of the machine technology is important for determining the allocation bases. The total number of machine hours (MH) was set at a maximum level of 2,000 MH/year, however, with real use of 87,5 %, it is necessary to consider a capacity of 1,750 MH/year. The declared performance per machine hour was at the level of 1,600 kg of the product mixture. The final price of the product thus includes direct production costs, which involve the cost of input material (wood waste overhead valued at the in-house price) and additional components (HDPE plastic granulate + binder valued at the market price); wage costs including the cost of technology staff and sales managers recalculated by the relevant LCR/MH; energy costs represent the recalculation of overheads for the propulsion of machinery technologies converted to ECR/SH and calculation depreciation as overhead calculated by DCR/MH. The share of the common overhead costs is expressed as an item of indirect costs of the enterprise, for which, according to calculations, it is necessary to reimburse them at the sales price by the Other Overhead Cost surcharge (OOC). To determine the proposed machine hours rate items in the calculation, it is possible to use methodological procedures with the direct application of their quantification (Tab. 3).

Tab. 3 Methodical procedure of quantification Calculation of Machine Hour Rates.

Labour Cost Rate / Machinery Hour – LCR/MH	LCR/MH = labor cost/ the planned time fund of the machine in MH = 149,910 €/1,750 MH = 85.66 €/MH
Energy Cost Rate / Machinery Hour – ECR/MH	ECR/SH = machine power rating × Ø % electrical capacity utilization × rate per unit of energy = 105 kW × 0.9 × 0.18 €/kWh = 17.1 €/MH
Depreciation Cost Rate / Machinery Hour – DCR/MH	DCR/MH = (machine acquisition price / machine lifetime × the planned time fund of the machine in MH) = 172,000 €/1,750 MH = 98.29 €/MH
Interest Cost Rate/ Machinery hour – ICR/MH	ICR/MH = (machine acquisition price from own capital / machine lifetime × the planned time fund of the machine) * the capital structure of the investment is without of own capital, therefore it is not necessary to calculate now.
Other Overhead Cost surcharge (OOC – %)	OOC = (other overhead cost)/(direct labor cost) × 100 = 83,654 €/ (149,910 € × 100) = 55.80 %

Source: Own processing according to Wöltje (2016); Mumm (2015)

Based on the practical knowledge of the cost structure presented in the investment project, it is possible to present the final calculation of the innovative Calculation of Machine Hour Rate (Tab. 4). The information base necessary for the quantification of calculation is presented in Table 3.

Tab. 4 Final Calculation of Machine Hour Rate.

Calculation item	Notes to calculation	Calculation Unit (€/48.5 kg WPC)	Calculation Unit (€/1 ton of mixture WPC)
Material Cost - sawdust	- own production 22 €/tonu	1.07	22.00
+ Material Cost (HDPE and additions)	- market price 620 €/tonu	18.04	372.00
+ Labor Cost Rate / MH	LCR 85.66 €/MH	2.60	53.54
+ Energy Cost Rate / MH	ECR 17.01 €/MH	0.52	10.63
+ Depreciation Cost Rate / MH	DCR 98.29 €/MH	2.98	61.43
= Total Production Cost		25.20	519.60
+ Other Overhead Cost	surcharge 55.8 %	1.45	29.87
= Total Own Cost of Product		29.65	549.47
+ Profit Margin	20 %	5.33	109.89
= Price without VAT		31.98	659.36

Source: Own processing

By comparing the results of both calculations, it is possible to identify slight differences in the sales price quantification. This was set at €661.19 per tonne of the mixture by a surcharge calculation. By the innovative method of Calculation of Machine Hour Rate, it was set at €659.36 per tonne of the mixture. This seemingly insignificant difference, however, is due to one fundamental fact. It should be stressed that the calculation methodologies were based on the input database of data on individual cost items from the concept of the investment project design. The latter was essentially considering conditions of homogeneous production, and this is the reason for the minimal differences in the sales price calculations. However, this fact should be explained and extended to the possibility of using diversified production, which is more widespread in practice. This could be identified with the possibility of variation of other surface and volume dimensions of WPC (especially its thickness), possibly changed proportions of wood-plastic components or subsequent final surface treatment. In this way, several diverse products could be created and thus, the effect of a more accurate calculation of machine hour rates would be presented. Based on the cost allocation requirement, these cost groups would need to be re-calculated into several products with different levels of allocation bases, which would also result in differences in costs and sales prices. Subsequently, it would be possible to specify the answer to the research question RQ2, which is hypothetical at this stage but would require additional information from the comparison of the sales price and alternative products. By comparing the calculated prices and cost of material inputs of a traditional composite product, it would also be possible to estimate the possible cost savings and the effect of a positive or negative impact on the profit margin. Based on the cost profitability of the industry (SK NACE 16 Manufacture of Wood in Slovakia), the minimum level of profit margin can be defined at the level of 9% (Yearbook of Industry 2021). Therefore, the answer to RQ2 has been so far rejected. It means that the *difference in price using the Calculation of Machine Hour Rate is not at such a level as to affect the minimum level of the profit margin of the product.* This area is the target of future research orientation, i.e., the application of calculation techniques to a broader product portfolio. The future direction of the research will also be oriented towards the possible application and subsequent comparison of the analytical method of environmental management - Life Cycle Assessment.

This area is the targeted objective of future research orientations. The study by Potkány and Škultétyová (2020) is a practical example of the use of the innovative methodological procedure with the Calculation of Machine Hour Rate, with the quantification of the difference in price change of the wooden table product, as well as the summarization of benefits. According to Tenovici (2014), the utilisation of this method has also been proven in manufacturing.

CONCLUSION

This paper pointed to wood as a suitable material for using CE principles. At the same time, there is a significant potential for its use in combination with plastic waste from the automotive industry. WPC is a product with a considerable innovation level, a significant environmental aspect, and a high level of added value. WPC with large dimensions can be used for wall or floor coverings in various settings, including administrative and industrial production areas. It is not necessary to treat the surface in any further manner. Thus, it may also be used in modern minimalist businesses, residential floors, warehouses, cottages, or anywhere where a non-absorbent, light, and lasting acne solution is desired. The concept of the investment project is the essential prerequisite for innovation and comparative methodological calculations, presented by the authors Osvaldová and Potkány (2021). Although the results of the comparison of the difference in methodological procedures for quantifying prices have not yet revealed a fundamental change in the allocation of costs, there is a high probability of an increase in the difference caused by possible variations in the final design of the product. This fact is considered a fundamental limitation of the paper, which suggestions for future research orientation can be eliminated.

However, the most significant effect of the use of the Calculation of Machine Hour Rate is expected not only in eliminating inaccuracies of overhead cost calculation through the use of fixed machine hour rates (Ostermann, 2010), but especially in the fact that such a design gives the possibility of a very rapid reaction and flexible adjustment of the changed conditions. It is a concept with a quickly applicable and adaptable change in the rate for the technological part of energy consumption, inflationary effects on changes in material inputs, and investment costs expressed in depreciation and interest rates. In the current turbulent times of frequent changes and uncertainty, this calculation is, therefore, an ideal option for quick decision-making, even concerning the dominant technicalization of production. The aim of the paper was to present a practical example of the application of the innovative methodological procedure for potential candidates from practice and to provide a database for discussion and future comparison of similar results within the identified research gap.

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