Table S1. Eco efficiency indexes of technology presented in literature.

Index	Mathematical model		Ref.
Environmental productivity (*EP*)	$EP = Q_V/E_I$	(1)	[1]
Environmental intensity of production (*EIoP*)	$EIoP = E_I/Q_V$	(2)	[1]
Environmental improvement cost (*EIC*)	$EIC = IC/IE_I$	(3)	[1]
Environmental cost-effectiveness (*ECE*)	$ECE = IE_I/IC$	(4)	[1]
Material Input per Service Unit (*MIPS*)	$MIPS = MI/S$	(5)	[2]
Factor X (*FX*)	$FX = EE_{EP}/EE_{RP}$	(6)	[3]
Total CO_2 efficiency (Eff_{CO_2tot})	$Eff_{CO_2tot} = P/E_{CO_2(I+D)}$	(7)	[4]
Direct CO_2 efficiency (Eff_{CO_2dir})	$Eff_{CO_2dir} = AV/ E_{CO_2(D)}$	(8)	[4]
Indirect CO_2 efficiency (Eff_{CO_2indir})	$Eff_{CO_2indir} = C/ E_{CO_2(I)}$	(9)	[4]
Integrated life cycle efficiency indicator ($E(t)$)	$E(t) = U(t)/N(t) = \sum U_i/(N_W + \sum N_i + N_z)$	(10)	[5,6]

Q_V—production value, E_I—environmental index, I_C—improvement cost, IE_I—environmental improvement index, MI—material input, S—service unit, EE_{EP}—eco-efficiency of the product, EE_{RP}—eco-efficiency of reference product, P—manufacture's price $E_{CO_2(I+D)}$—emission of CO indirect, direct, $E_{CO_2}(D)$—CO_2 direct emission $E_{CO_2}(I)$—CO_2 indirect emission, $U(t)$—benefits in the life cycle, $N(t)$—outlays in the life cycle, t—time of use, U_i—benefits in the time of i-th year of use, N_W—outlays at the manufacturing stage, N_i—outlays in the time of the i-th year of use, N_z—outlays in the post use management.

Table S2. Environmental assessment indexes for grinding according to literature.

Index	Mathematical Model		Ref.
Ecological efficiency (e_{EKO})	$e_{EKO} = \Delta E_{EKO}/K_{EKO} = E_{ur}/m_{CO_2}$	(1)	[7]
Non destructivity (D)	$D = f(L_{FCO_{2eq}} - L_{ACO_{2eq}})/Ee_{CO_{2eq}} \Rightarrow \min$	(2)	[8]
Material energy efficiency index ($E(m)$)	$E(m) = U(m)/N(m) = \sum U_j \cdot m/\sum N_j \cdot m$	(3)	[9]
Sustainable emissivity ($e_{zrów}$)	$e_{zrów} = P_R \cdot 1/\Delta E_{eco} \cdot t_R$	(4)	[10,11]

e_{EKO}—ecological efficiency index, K_{EKO}—use of natural resources, ΔE_{EKO}—increase in ecological benefits, E_{ur}—yearly average ecological benefit (elimination of emission), $g_{ekw}CO_2 \cdot kg^{-1}$ of ground product, m_{CO_2}—yearly average emission expenditures, $g_{ekw}CO_2 \cdot kg^{-1}$ of ground product, $L_{FCO_{2eq}}$—level of CO_{2eq} emission from fossil fuels, $L_{ACO_{2eq}}$—level of CO_{2eq} emission from alternative fuels, $Ee_{CO_{2eq}}$—electric energy corresponding to CO_{2eq}, emission, $U(m)$—benefit from energy and material use; $N(m)$—expenditure involved in material manufacturing and preparing, m—unit mass of the combusted material, Uj—unit energy profits, Nj—unit energy expenditures for preparation of the considered process, ΔE_{eco}—ecological benefit increase, kWh, P_R—power consumption in the grinding process, kW, t_R—grinding time, h.

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