

DAFTAR PUSTAKA

- Abdilah, Maulana Akbar dan Atikha Sidhi Cahyana. (2015). Analysis of Environmental Impact on Fertilizer Industry Using Life Cycle Assessment (LCA) Method. *Procedia of Engineering and Life Science* Vo.3 December. 2022.
- Acero, A.P., Rodriguez, dan Citroth, A. (2015). LCIA Methods-Impact Assessment Methods in Life Cycle Assessment and Their Impact Categories. GreenDelat, Germany.
- Air Quality Science IAQ Resources Center (Aerías). 2005. Carbon Dioxide: A Common Indoor Air Pollutant. www.Aerías.com
- Al Musyafak, A.Y., & Assomadi, A.F.(2022). Assessment of The Impact of air Emission on Petroleum Production in Company "A" using the Life Cycle Assessment (LCA) Method. *Jurnal Purifikasi*. Vol 21, No 2: 52-60.
- An, J., Li, Y., Middleton, R.S., 2018. Reducing energy consumption and carbon emissions of magnesia refractory products: A life-cycle perspective. *J. Cleaner Prod.* 182 (1), 363-371.
- Annisa, Naba Khoiru. 2022. Analisis Dampak Lingkungan Menggunakan Metode Life Cycle Assessment (LCA) Pada Instalasi Pengolahan Air (IPA) Gedek PT. Air Bersih Jatim. Universitas Islam Negeri Sunan Ampel.
- Arba, Yasfina dan Suyono Thamrin. Journal Review: Perbandingan Pemodelan Perangkat Lunak Life Cycle Assessment (LCA) untuk Teknologi Energi. *Jurnal Energi Baru & Terbarukan*, 2022, Vol.3, No.2, pp 142-153.
- Arianpour, F., Kazemi, F., Fard, F.G., 2010. Characterization, microstructure and corrosion behavior of magnesia refractories produced from recycled refractory aggregates. *Miner.Enf.* 23 (3), 273-276
- Bhakar, V., K. Uppala., V.V., Digalwar, A.K., et al. 2013. Life Cycle Assessment of Smithy Training Processes. *Pro. Eng.* 64 (2013) 1267-1275.
- Batjos, P., 2004. Groundwater chemical composition changes in the Dubravsky Massif hydrogeological structure, included by magnesite exploitation. *Acta Petrol. Sin.* 20 (4), 887-898.
- Canadian Center for Occupational and Health and Safety (CCOHS). 2005. Health Effects Carbon Dioxide gas. www.ccohs.ca/oshanswers/.
- Mochammad, dan Revrian Fajhri Andana. Study Valuasi Smelter Pengolahan el Melalui Pendekatan Analisa Biaya Manfaat (Studi Kasus: Perusahaan



- Tambang Nikel di Sulwawesi Selatan). *Jurnal Teknik Lingkungan* Vol.26, No.1 2020.
- Conejo, A.N., Lule, R.G., Lopez, F., Rodriguez, R., 2006. Recycling MgO-C refractory in electric arc furnaces. *Resour. Conserv. Recycl.* 49 (1), 14-31.
- Donald, J.R., Walsh, M.K., Burnham, C.D., et al. 1997. Dealing with Spent Refractories Material. Hatch Associates Ltd., Mississauga, ON.
- Erliyanti, Lucky.2019. Pengaruh Temperatur *Sintering* Terhadap Densitas, Porositas, dan Kekuatan *Bending Lining Refractory* Berbasis Limbah Evaporation Boats. Fakultas Teknik.Universitas Negeri Semarang.
- Fang, H., Smith, J.D., Peaslee, K.D., 1999. Study of spent refractory waste recycling from metal manufactures in Missouri. *Resour. Conserv.Recy.*25, 111-124.
- Ferreira, German, Lopez-Sabiron, A.M, Aranda Juan., et al. 2015. Environmental analysis for identifying challenges to recover used reinforced refractories in industrial furnaces. *J. Clean. Prod.* DOI: 10.1016/j.jclepro.2014.04.087
- Frischknecht, R., Wyss, F., Knöpfel, S. B., Lützkendorf, T., dan Balouktsi, M. (2015). Cumulative energy Demand in LCA: The Energy Harvested Approach. *International Journal Life Cycle Assessment*, 20, 957-968.
- Gaol, Martha Lumban. 2017. Life Cycle Assessment (LCA) Pengelolaan Sampah Pada Tempat Pemrosesan Akhir (TPA) Sampah. (Studi Kasus: TPA Jabon, Kabupaten Sidoarjo). Surabaya: Institut Teknologi Sepuluh Nopember.
- Gunawan, Andi. 2023. Analisis Life Cycle Assessment (LCA) Pada Industri Minyak Nilam (Pathouli Oil) di PT Cassia CO-OP Kota Sungai Penuh Provinsi Jambi. Universitas Jambi.
- Hanagiri, S. et al.2008. Recent Improvement of Recycling Technology for Refractories.Nippon Steel Technical Report.
- Han, J., Jiao, F., Liu, W., et al., 2016. Innovative methodology for comprehensive utilization of spent MgO-Cr₂O₃ bricks: cooper flotation. *ACS Sustain. Chem. Eng.* 4 (10), 5503-5510.
- Hauschild, M., Goedkoop, M., Guinee, J., Heijungs, R., Huijbregts, M., Jolliet, O., Margni, M., De Schryver, A., Humbert, S., Laurent, A., Sala, S., dan Pant, R. (2013). Identifying best existing practice for characterization modelling in life cycle impact assessment. *International Journal Life Cycle Assessment* 18, 683-697.
- T.R., Fahrurrozi, M., Bendiya, I.M., 2012. Life Cycle Assessment Pabrik semen PT Holcim Indonesia Tbk. Pabrik cilacap: Komparasi antara Bahan Bakar ubara dengan Biomassa. *Jurnal Rekayasa Proses*, Vol.6, No.2.



- Horckman, L., Nielsen, P., Dierckx, P., et al. 2019. Recycling of refractory bricks used in basic steelmaking : a review. *Resources, Conservation & Recycling* 140, 297-304.
- IPCC, 2006. IPCC Guidelines for National Greenhouse Gas Inventories. Intergovernmental on Climate Change (IPCC), 2006.
- ISO, 2006a.ISO 14044- Environmental management- Life cycle assessment- Requirements and guidelines. International Standard Organization (ISO), Geneve.
- ISO, 2006a.ISO 14040- Environmental management- Life cycle assessment- Principle and framework. International Standard Organization (ISO), Geneve.
- Jiang, X.M., 2011. Study on Advanced Energy Conservation Technology for fused Magnesia Smelt from Magnesite and the Crystallization Process of Periclase (Master's Thesis). Northeastern University, Shenyang, China.
- Jogdand, Surbhi Shivaji.2020. Some Study related to Refractory Waste Management in Sweden. KTH Royal Institute of Technology School of Industrial Engineering and Management School, Stockholm, Sweden.
- Kelvin.2021. Analisis Dampak Lingkungan dari Perusahaan Jasa Konstruksi di Surabaya dengan *Software SimaPro*. *Journal of Information System, Graphics Hospitality and Technology*. Volume 03, Nomor 02. Departemen Teknik Industri. Institut Sains dan Teknologi Terpadu. Surabaya. (Accessed April 22,2023).
- Khattab, M., Samya Hachemi dan Mohammad Fawzi Aljouni. 2021. Recycled Refractory Brick as Aggregate for Eco-friendly Concrete Production. *J. Advance Sciences and Engineering Technologies*. Vol 4 No 1, 32-49.
- Lehtinen, H., Saarentaus, A, Rouhiainen, J., et al., 2011. A Review of LCA Methods and Tools and their Suitability for SMEs. *Eorpe Innova Eco Innovation Biochem*.
- Li, J.H., Zhang, Y., Shao, S., Zhang, S.S., Ma, S.M., 2016. Application of cleaner production in a Chinese magnesia refractory material plant. *J. Clean. Prod.* 113, 1015-1023.
- Madias, J., dan San Nicolas., 2017. A review on recycling of refractories for the iron and steel industry.
- Massachusetts Department of Public Health (MDPH). 2005. Appendix 1-Carbon Dioxide and its Use in Evaluating Adequacy of Ventilation in Buildings. Massachusetts Bureau of Environmental Health Assessment, Department of Public Health. www.mass.gov/dph/beha/iaq/appendices/co2app.htm.



A.I.M.2011.Life cycle analysis and life cycle impact assessment methodologies: table of the art. Universita de Lleida, Lleida.

., Soto, A., Maza, D., Bayon, F, 2020. Life cycle assessment of refractory waste

- management in a Spanish steel works, 1-9.
- Murti, Rihastiwi Setiya dan Sugihartono. 2020. Bahaya Kromium Hexavalen (Cr VI) Pada Kulit Dan Produk Kulit Samak Krom Serta Upaya Pencegahannya. Vol.14 No.2 Desember.
- Mutiara, Shabrina Dyah. 2018. Penerapan Lean Thinking dan Life Cycle Assessment (LCA) untuk Meningkatkan Eco-Efficiency Pada Produk Backsheet Diapers. Intitut Teknologi Sepuluh Nopember.
- National Institute for Occupational Safety and Health (NIOSH). 1976. Criteria for a Recommended Standard, Occupational Exposure to Carbon Dioxide.
- Pré Consultants, 2016. SimaPro. <https://simapro.com/> (Accessed 30/04/2023)
- Pré Sustainability. 2023. SimaPro Database Manual Methods Library.
- Putri, H.P. 2017. Life Cycle Assessment (LCA) Emisi Pada Proses Produksi Bahan Bakar Minyak (BBM) Jenis Bensin Dengan Pendekatan Metode Analytical Hierarchy Process (AHP). *Institut Teknologi Sepuluh November. Surabaya.*
- Rahmat, Muhammad Rais. 2021. Perancangan dan Pembuatan Tungku *Heat Treatment*. Universitas Islam 45, Bekasi.
- Rahmatika, Nur Ikhsani. 2017. Analisis Risiko Paparan Nitrogen Dioksida (NO₂) Dari Polutan Ambien Terhadap Kesehatan Masyarakat di Kabupaten Magelang Tahun 2015. UIN Syarif Hidayatullah Jakarta.
- Rosmeika, R., Sutiarno, L., dan Suratmo, B. (2010). Pengembangan Perangkat Lunak Life Cycle Assessment (LCA) untuk Ampas Tebu (Studi Kasus di Pabrik Gula Madukismo, Yogyakarta). Universitas Gadjah Mada Yogyakarta.
- Rosyid, Anwar. (2022). Kajian Dampak Lingkungan dari Proses Produksi Pulp dengan Metode LCA: Evaluasi Program Perbaikan Eksisting. Institut Teknologi Sepuluh Nopember.
- Ruhiat, Y., dan Akbar, H. (2015). Treatment Limbah Industri Pulp dengan Metode Filtrasi untuk Menjaga Kualitas Air DAS Ciujung. *Jurnal Agrium*, 12 (1), 40-43.
- Sampe, Ovrianty Fery. 2018. Evaluasi Penambahan Silica Flux (SiO₂) dan Scrap Terhadap Proses Produksi si Converter#2 PT Vale. Indonesia Tbk. Politeknik ATI Makassar.
- Sari, April Lianita. 2019. Pengaruh Thermal Shock Resistance dan Komposisi Bahan Refraktori Terhadap Kekuatan Impact dna Struktur Makro. Fakultas Teknik. verstitas Negeri Semarang.
- D., Fang, H., Peaslee, K.D., 1999. Characterization and recycling of spent actory wastes from metal manufactures in Missouri. *Resour. Conserv. Recycl.*

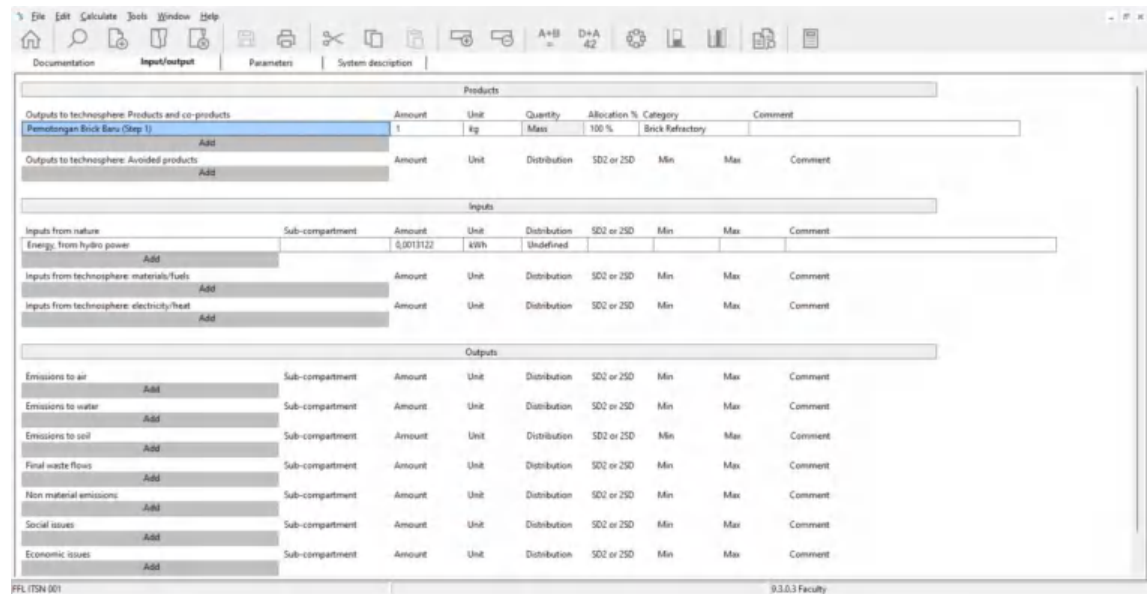
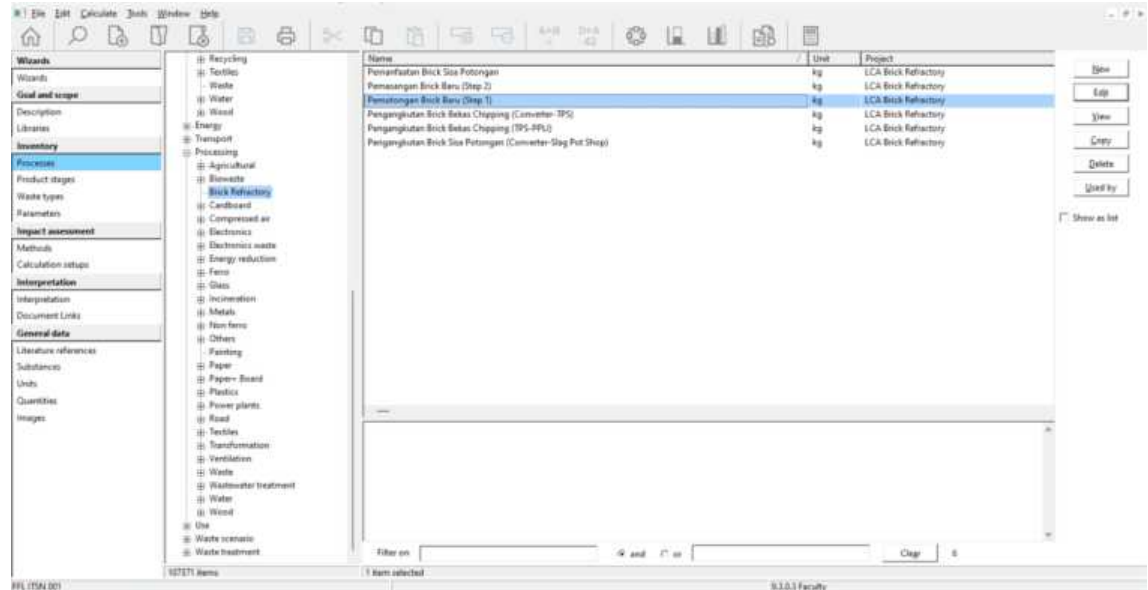


- 25, 151-169.
- Sukarlina, Nina dan Iphov Kumala Sriwana. 2022. Perancangan Sistem untuk Minimasi Limbah B3 di PT. XYZ Menggunakan Pendekatan SSM (*Soft System Methodology*). Jurnal Metris 23, 44-51.
- Toding, Nataniel. 2016. Mengoperasikan Pierce Smith Converter. Modul-PP-COV-CP-09. PT Vale Indonesia Tbk.
- Toxicology Review of Selected Chemicals.2005. Carbon Dioxide. OSHA's comments from the January 19,1989 Final on Air Contaminants Project. www.cdc.gov.
- Trisnawati, O.R., & Khasanah, N. 2020. Penyuluhan Pengelolaan Sampah Dengan Konsep 3R Dalam Mengurangi Limbah Rumah Tangga. Cakrawala, 4 (2), 153-168.
- WHO. (2013). Health Effects of Particulate Matter. World Health Organization, Copenhagen, Denmark.
- Widiyanto, Anugerah. 2022. Kontribusi Metode Life Cycle Assessment Biomassa untuk Agroindustri Berkelanjutan. Badan Riset dan Inovasi Nasional (BRIN).
- Wu, X.Y., 2007. The countermeasures for controlling magnesite pollution. Environ. Prot. Sci. 33 (5), 11e12, 20.
- Xue, K., Han, J., Jiao, F., et al., 2018. Comprehensive utilization of spent magnesite-chrome refractories with gravity separation followed by flotation. J. Min. Eng. Soc. 127, 125-133.
- Yang, D., Zeng, D.H., Zhao, Q., 2009. Soil contamination by magnesite dusts: its mechanism and phytoremediation. Chin. J. Ecol 28 (9), 1891-1896.
- 2021.PP Republik Indonesia Nomor 22 Tahun 2021 tentang Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup. Jakarta.



LAMPIRAN

Lampiran 1 Tahapan *running* data di SimaPro



Optimized using
trial version
www.balesio.com

C:\Users\Public\Documents\Simapro\Database\Professional: LCA Brick Refractory - [Edit processing process: 'Pemasangan Brick Baru (Step 2)']

File Edit Calculate Tools Window Help

Documentation Input/output Parameters System description

Products								
Outputs to technosphere: Products and co-products	Amount	Unit	Quantity	Allocation %	Category	Comment		
Pemasangan Brick Baru (Step 2)	1	kg	Mass	100 %	Brick Refractory			
Add								
Outputs to technosphere: Avoided products	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment	
Add								
Inputs								
Inputs from nature	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Water, lake		0.14355	l	Undefined				
Energy, from hydro power		0.00338	kWh	Undefined				
Add								
Inputs from technosphere: materials/fuels	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment	
Add								
Inputs from technosphere: electricity/heat	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment	
Add								
Outputs								
Emissions to air	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Emissions to water	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Emissions to soil	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Final waste flows	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Non material emissions	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Social issues	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Economic issues	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								

PFL ITSN 001 9.3.3.3 Faculty

C:\Users\Public\Documents\Simapro\Database\Professional: LCA Brick Refractory - [Edit processing process: 'Pangangkutan Brick Bekas Chipping (Converter-TPS)']

File Edit Calculate Tools Window Help

Documentation Input/output Parameters System description

Products								
Outputs to technosphere: Products and co-products	Amount	Unit	Quantity	Allocation %	Category	Comment		
Pangangkutan Brick Bekas Chipping (Converter-TPS)	0.47048957	kg	Mass	100 %	Brick Refractory			
Add								
Outputs to technosphere: Avoided products	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment	
Add								
Inputs								
Inputs from nature	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Energy, from oil		0.004933865	MJ	Undefined				
Add								
Inputs from technosphere: materials/fuels	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment	
Add								
Inputs from technosphere: electricity/heat	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment	
Add								
Outputs								
Emissions to air	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Carbon dioxide, fossil		0.000385599	kg	Undefined				
Methane		4.93386E-8	kg	Undefined				
Dinitrogen monoxide		2.96032E-9	kg	Undefined				
Add								
Emissions to water	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Emissions to soil	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Final waste flows	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Non material emissions	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								
Social issues	Sub-compartment	Amount	Unit	Distribution	SD2 or 2SD	Min	Max	Comment
Add								

PFL ITSN 001 9.3.3.3 Faculty



C:\Users\Public\Documents\Simah\Database\Professional: LCA Brick Refractory - [Edit processing process: Pengangkutan Brick Bekas Chipping (TPS-PPL)]

File Edit Calculate Tools Window Help

Documentation Input/output Parameters System description

Products

Outputs to technosphere: Products and co-products	Amount	Unit	Quantity	Allocation %	Category	Comment	
Pengangkutan Brick Bekas Chipping (TPS-PPL)	0.48367511	kg	Mass	100 %	Brick Refractory		
Add							
Outputs to technosphere: Avoided products	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add							

Inputs

Inputs from nature	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Energy from oil		82.1442	MJ	Undefined				
Add								
Inputs from technosphere: materials/fuels	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment	
Add								
Inputs from technosphere: electricity/heat	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment	
Add								

Outputs

Emissions to air	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Carbon dioxide		6.161707919	kg	Undefined				
Methane		0.00023442	kg	Undefined				
Dinitrogen monoxide		4.94095E-5	kg	Undefined				
Add								
Emissions to water	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Emissions to soil	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Final waste flows	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Non material emissions	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Social issues	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								

PFL ITSN 001 9.3.3.3 Faculty

C:\Users\Public\Documents\Simah\Database\Professional: LCA Brick Refractory - [Edit processing process: Pengangkutan Brick Sisa Potongan (Converter-Slag Pot)]

File Edit Calculate Tools Window Help

Documentation Input/output Parameters System description

Products

Outputs to technosphere: Products and co-products	Amount	Unit	Quantity	Allocation %	Category	Comment	
Pengangkutan Brick Sisa Potongan (Converter-Slag Pot)	0.047925241	kg	Mass	100 %	Brick Refractory		
Add							
Outputs to technosphere: Avoided products	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add							

Inputs

Inputs from nature	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Energy from oil		0.017131474	MJ	Undefined				
Add								
Inputs from technosphere: materials/fuels	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment	
Add								
Inputs from technosphere: electricity/heat	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment	
Add								

Outputs

Emissions to air	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Carbon dioxide		0.001289442	kg	Undefined				
Methane		1.71315E-7	kg	Undefined				
Dinitrogen monoxide		1.02789E-8	kg	Undefined				
Add								
Emissions to water	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Emissions to soil	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Final waste flows	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Non material emissions	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Social issues	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								

PFL ITSN 001 9.3.3.3 Faculty



C:\Users\Public\Documents\Simapro\Database\Professional: LCA Brick Refractory - [Edit processing process: Pemanfaatan Brick Sisa Potongan]

Documentation Input/output Parameters System description

Products

Outputs to technosphere: Products and co-products	Amount	Unit	Quantity	Allocation %	Category	Comment	
Pemanfaatan Brick Sisa Potongan	1,16198E-5	kg	Mass	100 %	Brick Refractory		
Add							
Outputs to technosphere: Avoided products	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add							

Inputs

Inputs from nature	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Water, lake		0.00478973	l	Undefined				
Energy, from hydro power		0.001962417	kWh	Undefined				
Add								
Inputs from technosphere: materials/fuels	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment	
Add								
Inputs from technosphere: electricity/heat	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment	
Add								

Outputs

Emissions to air	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Emissions to water	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Emissions to soil	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Final waste flows	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Non material emissions	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Social issues	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								
Economic issues	Sub-compartment	Amount	Unit	Distribution	SD2 or 250	Min	Max	Comment
Add								

PFL ITSA 001 9.3.0.3 Faculty

C:\Users\Public\Documents\Simapro\Database\Professional: LCA Brick Refractory - [LCA Explorer]

Wizards: Product stages, Waste types, Parameters, Impact assessment, Methods, Calculation setup, Interpretation, Document Links, General data, Literature references, Substances, Units, Quantities, Images

Name	Project	Status
LCA Brick Refractory (Scenario-1)	LCA Brick Refractory	None
LCA Brick Refractory (Scenario-2)	LCA Brick Refractory	None

Filter on: and or Clear 2

PFL ITSA 001 9.3.0.3 Faculty



C:\Users\Faculty\Documents\Simapro\Database\Professional: LCA Brick Refractory - [Edit assembly: LCA Brick Refractory (Scenario-1)]

File Edit Calculate Tools Window Help

Input/Output Parameters

Name: LCA Brick Refractory (Scenario-1) Status: Name: Comment:

Materials/Assemblies	Amount	Unit	Distribution	SDI or ZSD	Min	Max	Comment
Add							
Processes							
Pemasangan Brick Baru (Step 1)	1	kg	Undefined				
Pemasangan Brick Baru (Step 2)	1	kg	Undefined				
Pengangkutan Brick Bekas Chipping (Converter: SPG)	0,1184342	kg	Undefined				
Pengangkutan Brick Bekas Chipping (TPS-PPU)	0,1184342	kg	Undefined				
Add							

Image:

PFL / TDA / 001 9.3.0.3 Faculty

C:\Users\Faculty\Documents\Simapro\Database\Professional: LCA Brick Refractory - [Edit assembly: LCA Brick Refractory (Scenario-2)]

File Edit Calculate Tools Window Help

Input/Output Parameters

Name: LCA Brick Refractory (Scenario-2) Status: Name: Comment:

Materials/Assemblies	Amount	Unit	Distribution	SDI or ZSD	Min	Max	Comment
Add							
Processes							
Pemasangan Brick Baru (Step 1)	1	kg	Undefined				
Pemasangan Brick Baru (Step 2)	1	kg	Undefined				
Pengangkutan Brick Bekas Chipping (Converter: SPG)	0,475488957	kg	Undefined				
Pengangkutan Brick Bekas Chipping (TPS-PPU)	0,475488957	kg	Undefined				
Pengangkutan Brick Sisa Potongan (Converter: Sisa Pot)	0,047933342	kg	Undefined				
Pemasakan Brick Sisa Potongan	3,16186-5	kg	Undefined				
Add							

Image:

PFL / TDA / 001 9.3.0.3 Faculty



File Edit Calculate Tools Window Help

Wizards
 Goal and scope
 Description
 Libraries
 Secondary
 Processes
 Product stages
 Waste types
 Parameters
 Impact assessment
 Methods
 Calculation setups
 Interpretation
 Interpretation
 Document Links
 General data
 Literature references
 Substances
 Units
 Quantities
 Images

Product stages
 Assembly
 Disposal
 Life cycle
 Disposal scenario
 Disassembly
 Repair

Name	Project	Status
LCA Brick Refractory (Scenario-1)	LCA Brick Refractory	Name
LCA Brick Refractory (Scenario-2)	LCA Brick Refractory	Name

Network
 Analyze
 Compare
 Quantity analysis
 Select Tree
 Item
 Edit
 Item
 Item
 Copy
 Delete
 Used by

Item
 Edit
 Item
 Copy
 Delete
 Used by

Show as list

Filter on: and or Clear 2

2 items 2 items selected

9.3.0.3 Faculty

File Edit Calculate Tools Window Help

General Analysis options Chart options

Name
 Comment
 Calculation function
 Network
 Tree
 Analyze
 Compare
 Method

Product	Amount	Unit	Project	Comment
LCA Brick Refractory (Scenario-1)	1	#	LCA Brick Refractory	
LCA Brick Refractory (Scenario-2)	1	#	LCA Brick Refractory	

Current library
 Suffix
 Replacing library
 Suffix

Switches
☐ Exclude infrastructure processes
☐ Exclude long-term emissions

Help Calculate Close

9.3.0.3 Faculty



File Edit Calculate Tools Window Help

Impact assessment Inventory Process contribution Setup Checks Product overview

Status

Calculating

85%

Updating windows

Cancel

FFL / TSN 001

9.3.0.3 Faculty

C:\Users\Faculty\Documents\Simapro\Database\Professional: LCA Brick Refractory - [Compare LCA - 1] and LCA - 2]

File Edit Calculate Tools Window Help

Impact assessment Inventory Process contribution Setup Checks Checks GUT Product overview

Characterization Normalization

Skip categories With result = 0

Setup goes
Include long-term emissions
Per impact category

Se	Impact category	Unit	LCA Brick Refractory (Scenario-1)	LCA Brick Refractory (Scenario-2)
1	Acidic depletion (fossil fuels)	kg CO ₂ eq	6.88	6.23
2	Global warming (GWPP100a)	kg CO ₂ eq	5.52E-4	5.62E-4
3	Photochemical oxidation	kg PO ₄ -eq	1.49E-5	1.33E-5

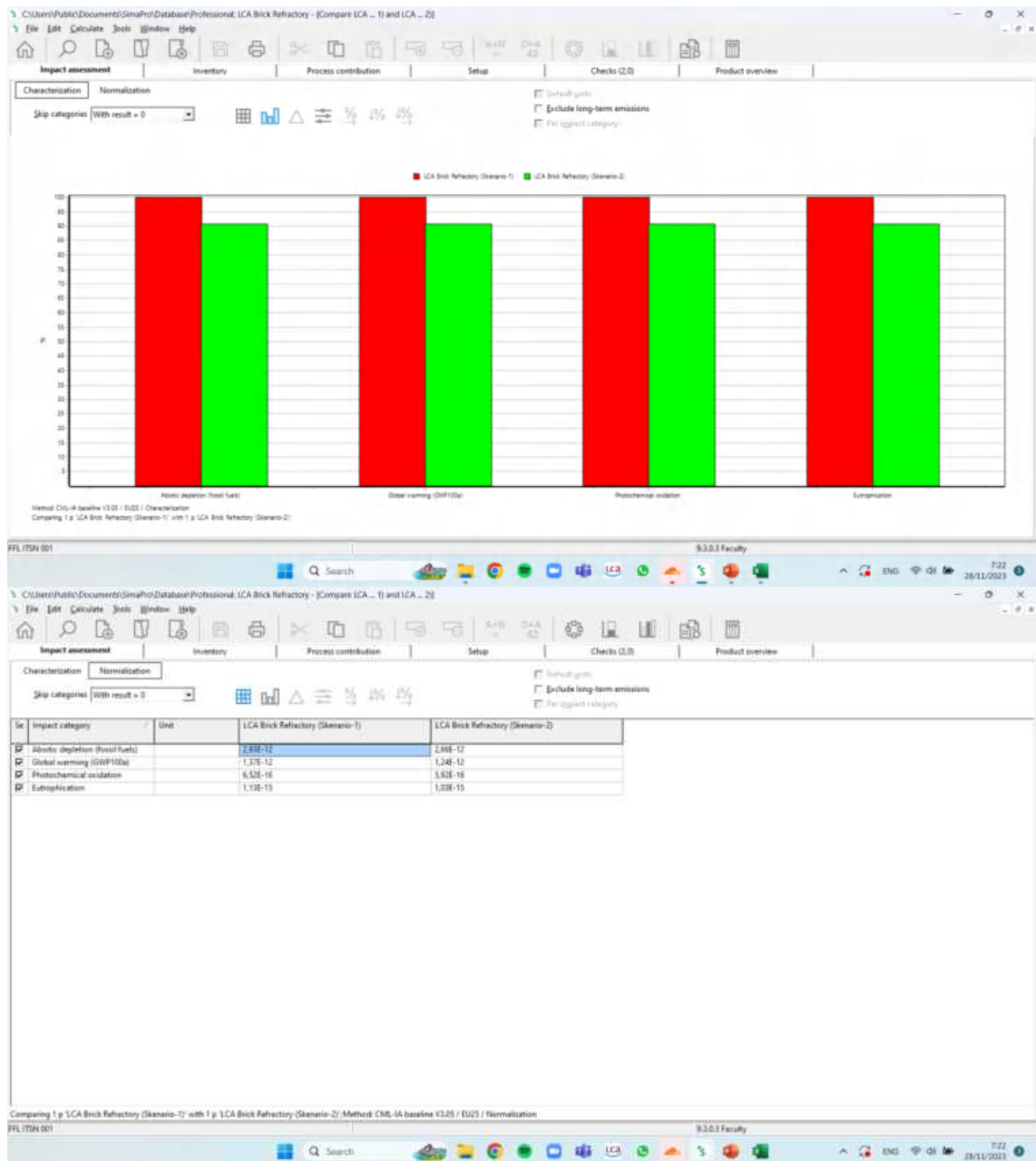
Comparing 1 p LCA Brick Refractory (Scenario-1) with 1 p LCA Brick Refractory (Scenario-2) Method: CML-IA baseline V3.05 / EU3 / Characterization

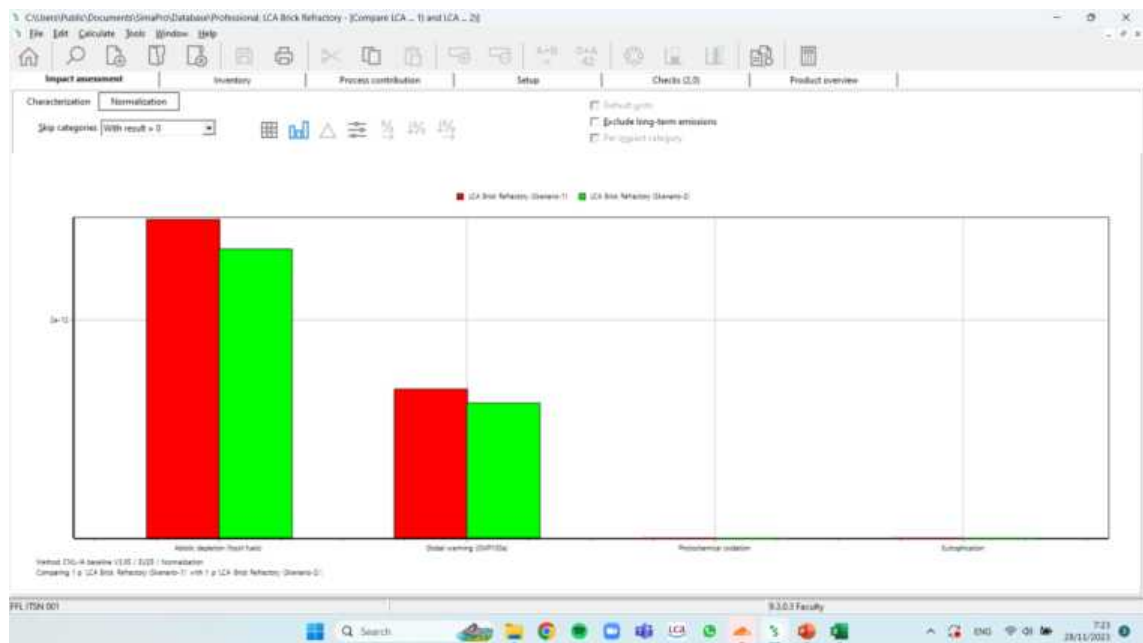
FFL / TSN 001

9.3.0.3 Faculty

7:22 28/11/2023







Lampiran 2 Tahapan penggunaan kembali brick bekas sisa potongan pada ladle penampung converter matte



Lampiran 3 Izin Penelitian



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
FAKULTAS TEKNIK
PROGRAM STUDI S2 TEKNIK LINGKUNGAN
 Jl. Poros Malino Km. 6, Bontomarannu (92172) Gowa, Sulawesi Selatan,
 Telp. (0411) 586015, 586262 Fax (0411) 586015,
<http://eng.unhas.ac.id> Email : teknik@unhas.ac.id

Nomor: 530/UN4.7.7/PT.01.04/2023

6 Januari 2023

Hal : Permohonan Izin Penelitian / Pengambilan Data

Kepada Yth.
 PT Vale Indonesia Tbk

Dengan hormat, kami sampaikan bahwa dalam rangka penyelesaian proposal pada Program Studi S2 Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin, maka kami mohon kebijaksanaan Bapak/Ibu kiranya berkenan memberikan kesempatan melakukan pengambilan data penelitian bagi mahasiswa :

Nama (NIM) : Fauziah Nur Aisyah (D092211006)

Atas perhatian dan kerjasama yang baik kami sampaikan terima kasih.

Ketua Program Studi S2 Teknik Lingkungan,



Dr. Roslinda Ibrahim, S.P., M.T.
 NIP. 197506232015042001

Tembusan :

1. Ketua Program Studi S2 Teknik Lingkungan FT-UH
2. Arsip

