

***LIFE CYCLE ASSESSMENT (LCA) PADA PROSES PRODUKSI PORTLAND
POZZOLAN CEMENT (PPC) DI PT SINAR TAMBANG ARTHALESTARI,
PROVINSI JAWA TENGAH***

Oleh:

Aisyah Putri Zahirah

114210037

INTISARI

Peningkatan kebutuhan semen mengakibatkan peningkatan produksi semen khususnya jenis *Portland Pozzolan Cemet* (PPC). Proses produksi semen yang meningkat menghasilkan dampak lingkungan yang tinggi seiring dengan penggunaan energi yang tinggi. Penelitian ini bertujuan untuk menganalisis data inventori, nilai potensi dampak lingkungan, dan *hotspot* pada proses produksi semen serta merekomendasikan arahan pengelolaan melalui skenario alternatif pada proses produksi semen PPC di PT Sinar Tambang Arthalestari yang merupakan produsen semen PPC dengan merk dagang Bima.

Metode analisis data dilakukan dengan metode *Life Cycle Assessment* (LCA) menggunakan *software* OpenLCA 2.4 dengan database ecoinvent. Metode LCA terdiri dari (1) *Goal and Scope*, (2) *Life Cycle Inventory*, (3) *Life Cycle Impact Assessment*, dan (4) *Interpretation*. Lingkup kajian yaitu *cradle to gate*, meliputi proses ekstraksi bahan baku, proses produksi, hingga pengemasan produk dengan *reference unit* 1 metrik ton semen PPC. Metode kategori dampak yang digunakan yaitu CML-IA baseline dan CML-IA non baseline.

Hasil nilai potensi dampak *Abiotic depletion (fossil fuels)* sebesar 4.476,32 MJ, *Acidification* sebesar 1,32 kg SO₂ eq, *Global warming* sebesar 673,72 kg CO₂ eq, *Human toxicity* sebesar 242,28 kg 1,4-DB eq, *Eutrophication (incl. fate)* sebesar 1,78 kg PO₄ eq, dan *Land Competition* sebesar 15,64 m²a. Potensi dampak terbesar yang menjadi tiga isu penting adalah *Global warming*, *Abiotic depletion (fossil fuels)*, dan *Eutrophication (incl. fate)* dengan *hotspot* berada pada unit proses *Pyroprocessing*. Alternatif skenario berupa substitusi bahan bakar alternatif menggunakan *Refuse Derived Fuel* (RDF) sebanyak 20% berhasil menurunkan potensi dampak lingkungan *Global warming* sebesar 5,99%, *Abiotic depletion (fossil fuels)* sebesar 18,57%, dan *Eutrophication (incl. fate)* sebesar 5,06%.

Kata Kunci: *Cradle to Gate*, Dampak Lingkungan, Penilaian Daur Hidup, Semen.

***LIFE CYCLE ASSESSMENT (LCA) OF PORTLAND POZZOLAN CEMENT
(PPC) PRODUCTION IN PT SINAR TAMBANG ARTHALESTARI,
CENTRAL JAVA***

By:

Aisyah Putri Zahirah
114210037

ABSTRACT

The increasing demand for cement has led to a rise in cement production, particularly of the Portland Pozzolan Cement (PPC) type. The increased production process has a significant environmental impact due to the high energy consumption involved. This study aims to analyze inventory data, environmental impact potential values, and hotspots in the cement production process, as well as recommend management directions through alternative scenarios in the PPC cement production process at PT Sinar Tambang Arthalestari, a PPC cement manufacturer under the Bima brand.

The data analysis method used is Life Cycle Assessment (LCA), conducted using OpenLCA 2.4 software with the ecoinvent database. The LCA method consists of (1) Goal and Scope, (2) Life Cycle Inventory, (3) Life Cycle Impact Assessment, and (4) Interpretation. The study scope is cradle to gate, covering raw material extraction, production processes, and product packaging with a reference unit of 1 metric ton of PPC cement. The impact category method used is CML-IA baseline and CML-IA non-baseline.

The results of the potential impact values are: Abiotic depletion (fossil fuels) at 4.476,32 MJ, Acidification at 1,32 kg SO₂ eq, Global warming at 673,72 kg CO₂ eq, Human toxicity at 242,28 kg 1,4-DB eq, Eutrophication (incl. fate) at 1,78 kg PO₄ eq, and Land Competition at 15,64 m²a. The three major impact categories identified are Global warming, Abiotic depletion (fossil fuels), and Eutrophication (incl. fate), with the hotspot located in the Pyroprocessing unit. An alternative scenario involving 20% substitution of fuel with Refuse Derived Fuel (RDF) successfully reduced the environmental impact potential of Global warming by 5,99%, Abiotic depletion (fossil fuels) by 18,57%, and Eutrophication (incl. fate) by 5,06%.

Keywords: *Cement, Cradle to Gate, Environmental Impact, Life Cycle Assessment.*