Proses pembuatan ferromangan pada submerged arc furnace dengan menggunakan campuran bijih mangan kadar rendah dan kadar menengah = Ferromanganese process using submerged arc furnace with mixed low grade and medium grade manganese ore

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Abstrak

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Potensi cadangan bijih mangan di Indonesia cukup besar, namun terdapat di berbagai lokasi yang tersebar di seluruh Indonesia. Komoditi ini menjadi bahan baku yang tidak tergantikan di industri baja dunia. Ferromangan (FeMn) merupakan logam paduan dengan komposisi 75% Mangan (Mn) dan 25% besi (Fe) yang umumnya digunakan pada proses peleburan besi/baja guna memperbaiki sifak-sifat mekanik dari produk yang dihasilkan.
Penelitian ini dilakukan untuk mempelajari pengaruh proses pencanpuran bijih Mn kadar rendah (LG) yang berasal dari Kab. Tanggamus, Lampung (16,3 %Mn-19,2 %Fe-20,2 %Si) dengan bijih Mn kadar menengah (MG) yang berasal dari Jember, Jawa Timur (27,7 %Mn-4,4 %Fe-14,7%Si) sebagai bahan baku untuk pembuatan logam FeMn dengan kandungan minimal sebesar 50 %Mn. Penelitian ini dilakukan sebanyak 5 kali percobaan dengan variasi pada campuran bijih Mn yaitu [1] 25 %LG+75 %MG, [2] 50 %LG+50 %MG, [3] 75 %LG+25 %MG, [4] 100 %LG, dan [5] 100 %MG. Bijih mangan diproses menggunakan Submerged Arc Furnace (SAF) dengan input berupa bijih Mn sebagai bahan baku utama, kokas sebagai reduktor, dan kapur sebagai aditif. Ketiga bahan baku tersebut dilebur hingga mencapai temperatur 1500 oC. Untuk mengetahui kualitas bahan baku dan produk FeMn yang dihasilkan, dilakukan analisa seperti XRF (X-Ray Fluoroscence), XRD (X-Ray Diffraction), AAS (Atomic Absorbtion Spectrometry), dan Proksimat.
Dari hasil penelitian didapatkan bahwa untuk percobaan [1] diperoleh logam FeMn sebanyak 5,2 Kg dengan kadar 54,05 %Mn, percobaan [2] diperoleh logam FeMn sebanyak 4,75 Kg dengan kadar 50,03 %Mn, percobaan [3] diperoleh logam FeMn sebanyak 4,6 Kg dengan kadar 36,44 %Mn, percobaan [4] diperoleh logam FeMn sebanyak 4,3 Kg dengan kadar 31,13 %Mn, dan percobaan [5] diperoleh logam FeMn sebanyak 12,8 Kg dengan kadar 75,19 %Mn. Pengaruh dari proses pencampuran (Mn-blend) dalam pembuatan ferromangan ini adalah semakin banyak komposisi bijih Mn kadar menengah (MG) yang digunakan, menyebabkan (a) semakin banyaknya kokas dan semakin berkurangnya kapur yang dibutuhkan, (b) meningkatnya yield, jumlah produk, serta kandungan persentase Mn dari FeMn yang dihasilkan, dan (c) semakin rendahnya konsumsi energi yang dibutuhkan.

ABSTRACT
The potential reserve of manganese ore in Indonesia is very large, but it was located in different locations spread throughout Indonesia. Manganese ore is one of raw material in producing ferromanganese that is not replaceable in the world steel industry. Ferromanganese (FeMn) is an alloying metal that contained of 75% Manganese (Mn) and 25% Iron (Fe) which is generally used in the process of iron/steel making to improve its mechanical properties.
In this experiment, ferromanganese production was conducted by blending two kinds of manganese ore, that was low grade Mn ore (LG) which derived from Tanggamus, Lampung (16,3 %Mn-19,2 %Fe-20,2 %Si) and medium grade Mn ore (MG) which derived from Jember, East Java (27,7 %Mn-4,4 %Fe-14,7 %Si), to obtain ferromanganese with a minimum content of 50 %Mn. The composition of Mn-blend in this experiment was [1] 25 %LG+75 %MG, [2] 50 %LG+50 %MG, [3] 75 %LG+25 %MG, [4] 100 %LG, and [5] 100 %MG. This mixed manganese ore was processed by using Submerged Arc Furnace (SAF). Cokes and limestone was added into the furnace as reductant and flux agent, respectively. Those raw materials are smelted until 1500 °C. To determine the composition of raw materials and the product of FeMn, analysis such as XRF (X-Ray Fluorescence), XRD (XRay Diffraction), AAS (Atomic Absorption Spectrometry), and proximate have to be done.
From each composition of Mn-blend above in this experiment, it was obtained that [1] 5,2 Kg of FeMn with 54,05 %Mn, [2] 4,75 Kg of FeMn with 50,03 %Mn, [3] 4,6 Kg of FeMn with 36,44 %Mn, [4] 4,3 Kg of FeMn with 31,13 %Mn, and [5] 12,8 Kg of FeMn with 75,19 %Mn. The effect of Mn-blend in this ferromanganese production was by the increasing composition of the medium grade manganese ore (MG) that will cause: (a) the increasing number of cokes and the decreasing of limestone required, (b) the increasing of yield, the number of products, and also the percentage of manganese content FeMn, and (c) the decreasing of energy consumption required., The potential reserve of manganese ore in Indonesia is very large, but it was located in different locations spread throughout Indonesia. Manganese ore is one of raw material in producing ferromanganese that is not replaceable in the world steel industry. Ferromanganese (FeMn) is an alloying metal that contained of 75% Manganese (Mn) and 25% Iron (Fe) which is generally used in the process of iron/steel making to improve its mechanical properties.
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