

The development history and use of slag in Portland cement

(1) Slag development history

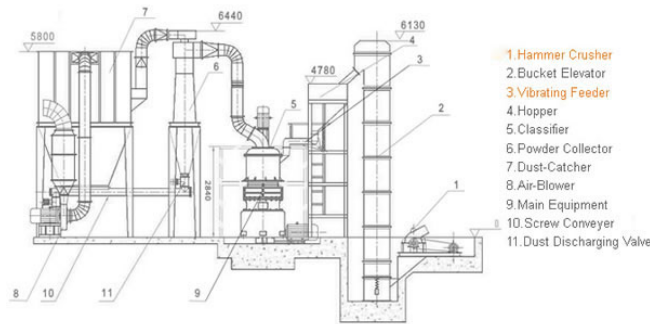
Early use of [blast furnace slag](#) in the United States was prompted by the desire to make use of material that was considered an expensive waste product. Its use in earnest started in the early 1900s in the construction field, principally for railroad ballast, portland-cement-concrete aggregate, and aggregates for bituminous and other types of road construction.

The National Slag Association carried out a survey of slag shipments in the United States for the first time in 1938. In 1939, the first year for which comprehensive figures of marketed slag are available, 8.3 million metric tons of blast furnace slag valued at \$6.4 million was used. The slag output from blast furnaces in 1947, the first year in which the U.S. Bureau of Mines collected production statistics, reached almost 30 million tons. Most slag was used in highway construction and railroad ballast.

In 2000, 8.9 million tons of blast furnace slag valued at \$58.3 million and 5.1 million tons of steel slag valued at \$20.1 million were used. Major uses were in road construction, asphaltic concrete aggregate, portland cement manufacture, and various concrete products. In the early years of slag use, prospective consumers thought that slag was subject to disintegration and corrosion and was brittle. Slag cements also were questioned, and slag wool was believed to have high sulfur content. Only after years of research and promotion were these objections overcome. In 2000, the ferrous slag industry enjoyed the benefits of many individual and collective efforts expended in the development of slag markets.

Nowadays, both blast furnace slag and steel slag contain a number of minerals that make them good feedstock material for cement manufacturing. Steel slag in particular usually has high lime content, similar to that of cement clinker. Now it widely use in the construction field, principally for railroad ballast, portland-cement-concrete aggregate, and aggregates for bituminous and other types of road construction.

(2) Slag processing technology



No significant developments were made in slag processing technology during 2000. Because slag is a low unit-value, high volume commodity, and slag processing is an established, conservative industry, all the slag that is processed is readily sold. Therefore, the industry seldom feels the need for innovations and, therefore, invests little, if any, in expensive research efforts. Previously reported advancements in granulating techniques resulted in some improvements in slag granulation systems, especially in reducing the energy costs.

[Great wall](#) can provide advance slag processing technology and "turnkey service" in low energy cost. Slag processing systems has the advantages in the following:

1. A good return on investment, can recover the cost-effective
2. High efficiency, energy saving, environmentally friendly
3. Mature general contrasting scheme
4. The customers case witness all over the country.

(3) [Slag powder production line](#) investment return

Project	index	actual motion
commissioning date	commissioning date	april,2011
investment calculations	total investment	50million
	cost of raw material	70 yuan/t
cost account	Production costs (including wages, electricity, coal, maintenance fees, cost of sales, etc.)	50 yuan
	Price	160 yuan/t
profit calculation	profit per ton	30 yuan/t
	annual profit	30×60million=1800million

economic benefit	2 years and 10 months recycling all investment (now in a state of pure profit)	
The quality of slag powder	Specific surface area	430 m ² /kg
	7 d activity index activity index	Can reach 100% Achieve GGBS national standard S95 level above
Product Sales	Product sales region	Product sales in xinxiang, shangqiu, xuchang, etc

(4)Slag is used in Portland cement manufacturing

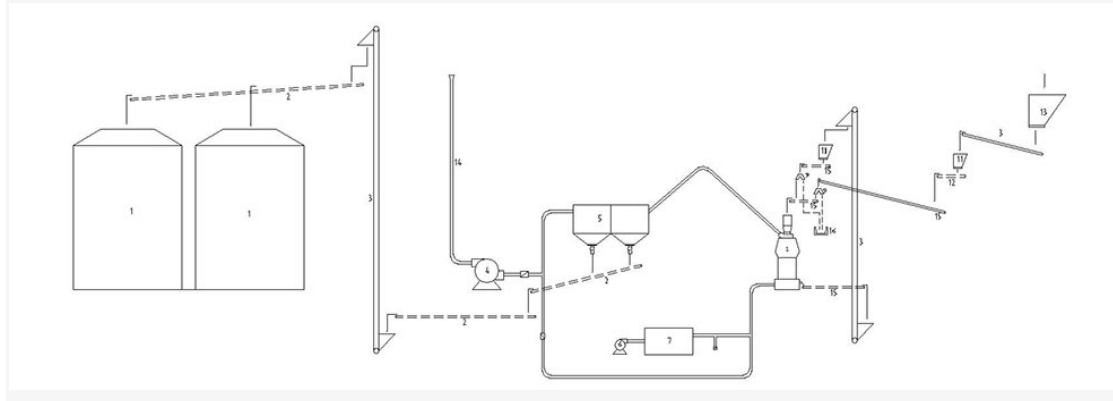
Portland cement is composed of calcium silicates, calcium aluminates, calcium alumio ferrites and usually some gypsum. When water is added to the cement, the calcium minerals hydrate and form a gel. This gel is what holds the aggregate together in concrete. To make cement, the raw materials are usually dried and ground, and then the mixture is heated in a kiln to form clinker. The clinker is then mixed with gypsum and other materials and ground into the fine powder known as Portland cement. The main methods of using IRC materials in cement manufacturing are using the byproduct materials in place of traditional raw materials, or by using the byproduct materials as a cement substitute in the final product.



Slag is used widely in many areas, especially used in Portland cement manufacturing, Slag powder production has large investment return ,So slag recycling and recusing has become the urgent problems for solution, Great Wall has the

advance technology to process the waste slag, Great Wall machinery is a professional supplier of slag powder production line, can provide "turnkey service" from civil engineering to debugging and capacity and standard reaching to customers, let customers put into production of mineral powder with saving worry, saving effort and high-efficiency.

(5)Great Wall machinery slag powder production line process diagram



(6)Great wall GGBS production line customer case:



300,000t/a GGBS Production Line of Tangshan Hongyan Building Material.



600,000t/a Slag Powder Demonstration and Training Base



600,000 t/a GGBFS Plant for Xinji Gangxin Cement Co., Ltd



900,000 t/a GGBS Plant of Hongyan Building Materials Co., Ltd.



1.5 Million t/a GGBS Plant of Baosteel Group Corporation