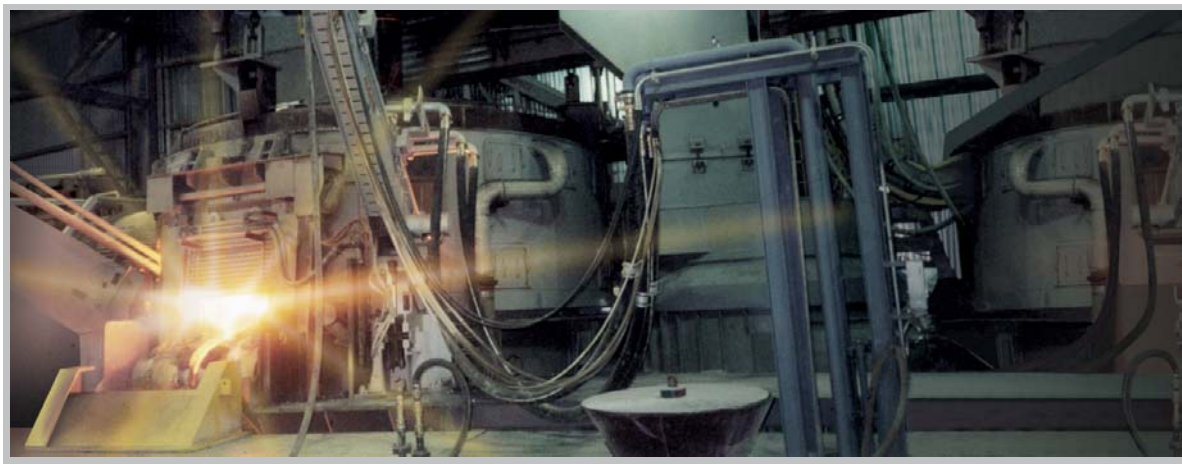
CARMEUSE™
NATURAL CHEMICALS

TECHNICAL BULLETIN

Steel Industry

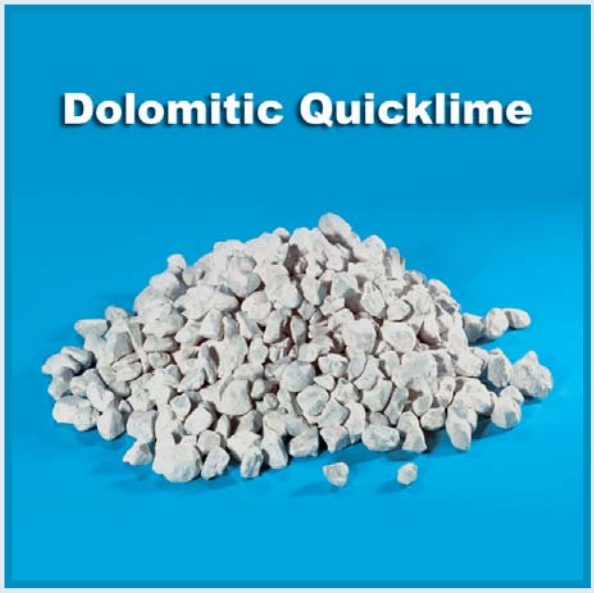


Dolomitic Quicklime

Lower flux cost by 20% when you use Dolomitic Quicklime to replace Chinese Magnesite...

Revision: 1/10/2003

...this modified flux practice demonstrates large savings in manufacturing cost without reduction in technical performance or product quality.



Lime, the Proven Solution!

Extended furnace refractory life and lower refractory maintenance cost achieved with the previous use of Chinese Magnesite are sustained. With dolomitic quicklime you can depend on CONSISTENCY for your MgO slag requirements.

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Carmeuse North America
11 Stanwix Street, 11th Floor
Pittsburgh, PA 15222

Phone: 866-243-0965 / 866-780-0974
Fax: 412-995-5515
E-mail: salesinfo@carmeusena.com
Internet: www.carmeusena.com

Technical Discussion

Industry Research:

In a controlled study aimed at a critical evaluation of Dolomitic Quicklime versus Chinese Magnesite*, Dr. R.J. Fruehan demonstrated equivalent chemical slag performance in the application of Chinese Magnesite-High Calcium Quicklime flux and Dolomitic Quicklime-High Calcium Quicklime. For the EAF steel maker, the control of slag basicity (B_3=%CaO/%SiO_2+Al_2O_3) is critical, along with maintenance of a slag saturated with magnesium (8-15%) to provide protection to the refractory.

- To produce an effective flux material, any MgO and CaO added to the furnace must be in solution, and so the manner and rate of dissolution of the added fluxes is of primary concern. The Fruehan study looks in detail at the mechanisms and rates of dissolutions of the compared flux mixtures.
- Once in the solution, the amount of MgO available is critical in maintaining refractory life. This recommended procedure ensures that equivalent MgO is added to the furnace, and that the MgO and CaO chemistry is unchanged from the previous practice when using Chinese Magnesite. The cost difference is easily computed.

* "Dissolution of Magnesite and Dolomite in Simulated EAF Slags", Dr. R.J. Fruehan, Y. Li, and L. Brabie, Carnegie Mellon University.

Conclusions

Fruehan concludes:

"The rate of dissolution of magnesite and dolomite are essentially the same for similar conditions. For dolomite, it appears that the CaO is dissolved away first and the MgO grains enter the slag where they dissolve. No solid layers of calcium silicate were found for EAF conditions. For magnesite, the slag penetrates into the particle and solid layers of FeO • MgO form the MgO grains.

As long as the basicity is below about two, dolomite should go into solution rapidly. For magnesite, the MgO content must also be significantly below saturation for rapid dissolution. The differences are considered insignificant for the steel maker".

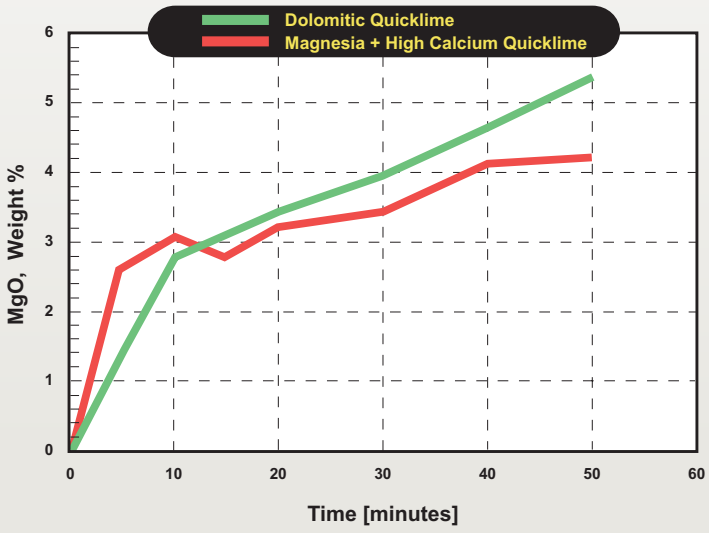
Equivalent product calculations:

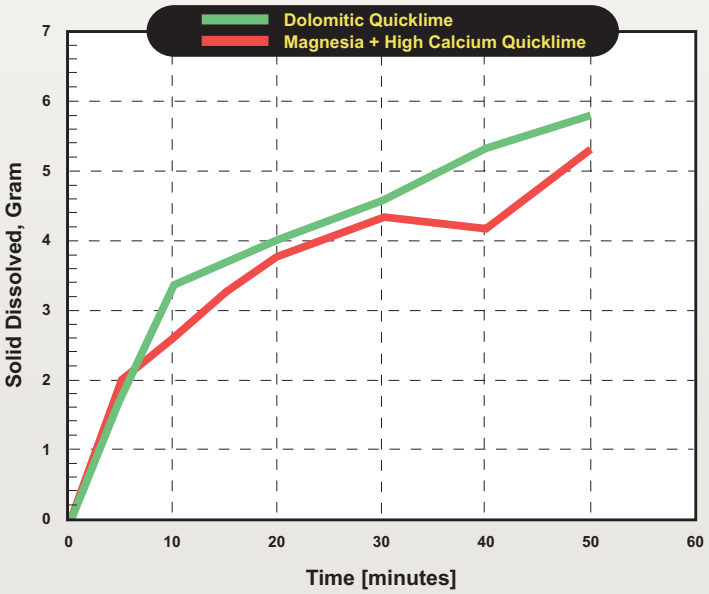
In addition to MgO, the use of dolomitic lime in place of Chinese Magnesite adds valuable calcium oxide to the steel making process, which is taken into account when calculating the relative amounts of Dolomitic Lime and High Calcium Lime that must added to the furnace.

Dr. Fruehan confirms, "In addition, the CaO contributed from the Dolomitic Lime is obviously of the same value to the steelmaker as the CaO derived from High Calcium Lime".

What does this mean for the steel maker in practical terms?

The comparison study on the back of this brochure uses the Carmeuse calculator tool and demonstrates the cost savings available utilizing this approach for a typical steel maker.





These graphs demonstrate the rates of dissolution of MgO, essential in providing magnesium in a form available to provide protection to the furnace refractory.

Calculate your potential savings. Let Carmeuse North America calculate the savings available to your operations. See calculator on the back page.

EAF SHOP EXAMPLE (WORKSHEET)

	Magnesite Practice	Equivalent Dolomitic Lime Practice	Your Practice	Equivalent Dolomitic Lime Practice
Tons of steel per heat	92	92		
Pounds of High Calcium Lime per heat	8,857	4,660		
Pounds of Dolomitic Lime per heat	-	7,250		
Pounds of Magnesite per heat	3,061	-		
Pounds of other flux per heat (_____)	-	-		
% CaO in High Calcium Lime	97.0 %	97.0 %	97.0 %	97.0 %
% MgO in High Calcium Lime	2.0 %	2.0 %	2.0 %	2.0 %
% CaO in Dolomitic Lime	57.0 %	57.0 %	57.0 %	57.0 %
% MgO in Dolomitic Lime	40.0 %	40.0 %	40.0 %	40.0 %
% CaO in Magnesite	2.0 %	2.0 %	2.0 %	2.0 %
% MgO in Magnesite	92.0 %	92.0 %	92.0 %	92.0 %
% CaO in other flux (_____)				
% MgO in other flux (_____)				
Approximate delivered price of High Calcium Lime per ton	$ 68.00	$ 68.00		
Approximate delivered price of Dolomitic Lime per ton	$ 84.00	$ 84.00		
Approximate delivered price of Magnesite per ton	$ 175.00	$ 175.00		
Approximate delivered price of other flux per ton	-	-		
Pounds of CaO per heat	8,653	8,653		
Pounds of MgO per heat	2,993	2,993		
Cost per heat - High Calcium Lime	$ 301.14	$ 158.44		
Cost per heat - Dolomitic Lime	-	$ 304.50		
Cost per heat - Magnesite	$ 267.84	-		
Cost per heat - other flux	-	-		
TOTAL FLUX COST PER HEAT	$ 568.98	$ 462.94		
FLUX COST PER TON OF STEEL	$ 6.18	$ 5.03	$	$

TONS OF STEEL PER YEAR	**440,000**	
FLUX SAVINGS PER TON OF STEEL	**$ 1.15**	
Annual Savings	**$ 507,126**	